CARBON MARKETS

Are They Right for Your Land Trust?

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Together, conserving the places you love

The Land Trust Alliance's mission is to save the places people need and love by strengthening land conservation across America.

Founded in 1982, the Land Trust Alliance is the voice of US land conservation, representing 1,000 land trusts and their 4.6 million supporters nationwide. As the national leader in policy, standards, education and training, the Alliance works passionately to support land trusts so they can save and secure more lands now and for future generations. The Alliance is based in Washington, DC, and operates several regional offices. More information is available at www.landtrustalliance.org.

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Bison herd in Heartland Ranch Nature Preserve. Photo courtesy of Environmental Defense Fund / Sean Boggs, photographer.

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INTRODUCTION

As the planet wraps up its hottest decade on record, the human and financial cost of climate change continues to rise. As a result, governments around the globe have set ambitious targets to stem **greenhouse gas** (GHG) emissions, but it has become clear that these climate targets cannot be met without the protection, restoration and sustainable use of nature and biodiversity.

The Intergovernmental Panel on Climate Change (IPCC) has made it clear that to limit warming to 1.5° Celsius, we need a multi-pronged approach. In addition to transforming the energy and transportation sectors, we need to change how we use land.

The nation's land trusts can lead the way with natural climate solutions, which include conservation, restoration and improved land management practices across forests, wetlands, grasslands, farms and ranches that help mitigate climate change.

Worldwide, these natural climate solutions could deliver up to a third of the carbon **reduction** necessary by 2030 to keep global warming in check. In the United States, natural climate solutions have the potential to remove the equivalent of 21 percent of the United States' net annual emissions of greenhouse gases from burning fossil fuels—in addition to the nearly 800 million **metric tons** of carbon dioxide our land is already sequestering.[1]

Annually in the United States, forests and forest products capture and store almost 15 percent of the country's carbon emissions from burning fossil fuels.[2] They have the potential to capture nearly twice as much if we plant more trees, use climate-smart practices to manage our forests and take other actions.

Grasslands cover as much as one-third of the world's lands, and grazing is the most extensive land use on the planet. In the United States, grasslands cover about 358 million acres—more than twice the area of Texas.[3] Grasslands store fairly high levels of carbon in their soils, but a significant fraction is being lost through conversion to cropland or overgrazing. Avoiding the conversion of grassland to cropland can help reduce carbon emissions by up to 107 million metric tons a year.

By implementing natural climate solutions (improved forest management, reforestation and avoided grassland conversion, to name a few), land trusts can help draw down and sequester carbon while providing valuable additional benefits, such as increased wildlife habitat, enhanced flood control and water purification and improved soil health.

Carbon markets can help finance natural climate solutions, creating a new source of revenue for landowners engaged in sustainable management and conservation of natural and working lands. For land trusts, the carbon markets can

Greenhouse gas: Gas that contributes to global warming and climate change. For the purposes of this publication, greenhouse gases are the six gases identified in the Kyoto Protocol: carbon dioxide; nitrous oxide; methane; hydrofluorocarbons; perfluorocarbons; and sulfur hexafluoride.

Reduction: The avoidance or prevention of an emission of greenhouse gases. Reductions are calculated as gains in carbon stocks over time relative to a project's baseline.

Metric ton or tonne: A common international measurement for the quantity of greenhouse gas emissions, equivalent to about 2,204.6 pounds or 1.1 tons.

WHAT IS A CARBON PROJECT?

A carbon project is an action or set of actions undertaken to lower atmospheric concentrations of greenhouse gases, typically CO_2. Carbon projects can generate financial benefits that flow from the production of climate benefits. These financial benefits are derived from participation in a carbon market.

Arizona Land and Water Trust. Photo courtesy of DJ Glisson II, Firefly Imageworks.

help raise revenue to pay for land acquisition, conservation easements and stewardship.

This publication lays out the basics of carbon markets and highlights how land trusts can use them to achieve their conservation and stewardship goals. It provides background on different types of projects and how they are developed and presents case studies of land trust carbon projects. When reading the case studies, it is important to note that some of the projects featured date back several years, so current market pricing for services and credit transactions will be different from what is presented here. Finally, this publication includes a handy glossary of terms and a list of additional resources. For more in-depth guidance for land trusts interested in siting carbon projects on easement lands, see the Land Trust Alliance's *Carbon Offsets in Conservation Easements: The Essentials for Land Trusts*.

01

CARBON MARKETS AND REGISTRIES

Carbon markets are a type of ecosystem services market designed to help address climate change by creating financial incentives for activities that reduce greenhouse gases. They match buyers seeking reduction credits to compensate for their emissions with sellers who generate these credits through resource management activities that are above and beyond **business as usual**.

A carbon credit represents one metric ton of carbon dioxide equivalent that has been reduced, removed or sequestered from the atmosphere. Carbon-crediting programs develop rigorous project **protocols** to ensure that the emission reductions are real and more than "business as usual," and they issue credits to projects that meet protocol requirements. Protocols are specific to a carbon project type and vary by carbon-crediting programs. Protocols include rules for project eligibility, quantification, **permanence**, monitoring, reporting and **verification**. Carbon-crediting programs also ensure transparency and good governance by providing oversight of third-party companies that verify carbon accounting and compliance with protocols. The carbon-crediting programs also list project documentation and track credit ownership in public registries. These requirements and processes are essential to ensuring the environmental and financial integrity of the carbon market.

Carbon markets are commonly categorized as either *compliance* or *voluntary* markets. Government agencies regulate compliance markets where businesses purchase carbon credits to meet legal requirements for emissions reductions. Major compliance programs operating in the United States include California's Cap-and-Trade Program, administered by the California Air Resources Board (CARB), and the Regional Greenhouse Gas Initiative (RGGI), which operates in New England and the Mid-Atlantic states. The voluntary carbon market, on the other hand, is where consumers or businesses purchase carbon credits to address voluntary actions, such as offsetting flight emissions or emissions from business operations to meet social responsibility pledges. Independent carbon registries, which administer voluntary carbon crediting programs, issue credits sold on the voluntary market. Because carbon credits cannot be held in hand or weighed on a scale, science-based protocols and transparency are critical. Publicly viewable and public reviews of scientific protocols and programs are hallmarks of trusted registries. The most-used voluntary carbon programs in the United States are those administered by the American Carbon Registry (ACR) and the Climate Action Reserve (CAR).

Business as usual: The activities and associated greenhouse reductions and removals that would have occurred in the project area in the absence of incentives provided by a carbon market. Methodologies for determining these activities—and for approximating carbon stock levels that would have resulted from these activities—vary by registry program and project type.

Protocol: A document that contains the eligibility rules, greenhouse gas assessment boundary, quantification methodologies, monitoring and reporting parameters and so forth for a specific project type. Project protocols are also referred to as *methodologies*, with the terms used interchangeably depending on the registry.

Permanence: The requirement that greenhouse gases must be permanently reduced or removed from the atmosphere for projects to be issued carbon credits. For sequestration projects, this requirement is met by ensuring that the carbon associated with credited greenhouse gas reductions and removals remains stored for at least a minimum number of years defined by the applicable registry.

Verification: The process of reviewing and assessing all a project's reported data and information by an accredited **verification body**, to confirm that the project owner has adhered to the requirements of this protocol. Verification can take two forms: see *desk verification* and *site verification*.

INTERNATIONAL PRINCIPLES GOVERNING CARBON CREDIT STANDARDS

The international community has identified seven standards that define high quality carbon credits with environmental integrity and credibility.

1. **Additional.** The project activity must be additional to what would have occurred in a baseline, or business as usual, scenario; and the project activity would not have occurred without the financial incentive of carbon benefits. Most carbon programs use a performance standard approach to assess additionality because it reduces transaction costs for **project developers**, alleviates uncertainties for investors and increases the transparency of project approval and verification decisions. The performance standard approach focuses on identifying a standardized baseline scenario and performing specific tests. If the project emits fewer greenhouse gases (or sequesters more carbon) than the baseline, the project is additional. Common performance standard tests include technology benchmarks, performance benchmarks, financial screens or other screens for eligibility. For land-use projects, additionality is based on an assessment of whether the project activity is legally required by law or by existing encumbrances (e.g., a **conservation easement**) and whether the project maintains or enhances carbon storage on the land, compared with a baseline scenario.
2. **Permanent**. The greenhouse gas reductions, **removals** or sequestration must effectively remain out of the atmosphere permanently. For sequestration projects where there is a possibility that carbon that has been sequestered may be released back to the atmosphere (**reversals**), carbon registries define a length of time carbon must be sequestered and there must be mechanisms in place to compensate for any reversals.
3. **Complete, conservative and accurate**. The accounting of the net climate benefits of a project must include all relevant **greenhouse gas sinks**, sources and reservoirs associated with project development, implementation and ongoing management. Projects must use conservative assumptions, values and procedures to ensure that net climate benefits are not overestimated. Accounting procedures and data sources used must be based on sound science, with uncertainties and bias reduced as far as practical.
4. **Verifiable/confirmable**. The accounting of net climate benefits must be replicable and verifiable by an objective third party who must be able to conduct detailed assessments and review monitoring and reporting data and project implementation documents to ensure that the data are complete and accurate.
5. **Transparent**. Project documentation, including accounting, monitoring and reporting data, implementation and verification reports and offset credit ownership, must be publicly available and traceable as far as practical.
6. **Not double-counted.** Reductions from an **offset** project can only be issued credits once.
7. **Enforceable.** Offset ownership is undisputed, and enforcement mechanisms exist to ensure that all program rules are followed and the market's environmental integrity is maintained.

Verification body: An organization or company that has been ISO-accredited and approved by the applicable registry or CARB to perform greenhouse gas verification activities for specific project protocols.

Project developer: An organization or individual that registers projects for the purpose of generating emission reductions or removals. The project developer may be the same entity as the project owner or may act as a technical consultant on behalf of the project owner.

Qualified conservation easement: Carbon programs may use the term *qualified* to describe a conservation easement that includes the terms and conditions specified by the applicable carbon program or protocol to address management requirements that affect carbon stocks within the project area. The easement will apply to current and all subsequent project owners for the full duration of the project's minimum time commitment. In this context, it does not refer to the IRS definition of *qualified conservation easements*.

Removal: Sequestration or removal of carbon dioxide from the atmosphere caused by a project. Removals are calculated as gains in carbon stocks over time relative to a project's baseline.

Reversal: A decrease in the stored carbon stocks associated with quantified greenhouse gas reductions and removals that occurs before the end of the project life. In general, a reversal is deemed to have occurred if there is a decrease in the difference between project and baseline onsite carbon stocks from one year to the next, regardless of the cause of this decrease.

Greenhouse gas sink: Any reservoir, natural or otherwise, that absorbs more carbon than it releases and thereby lowers the concentration of greenhouse gases in the atmosphere.

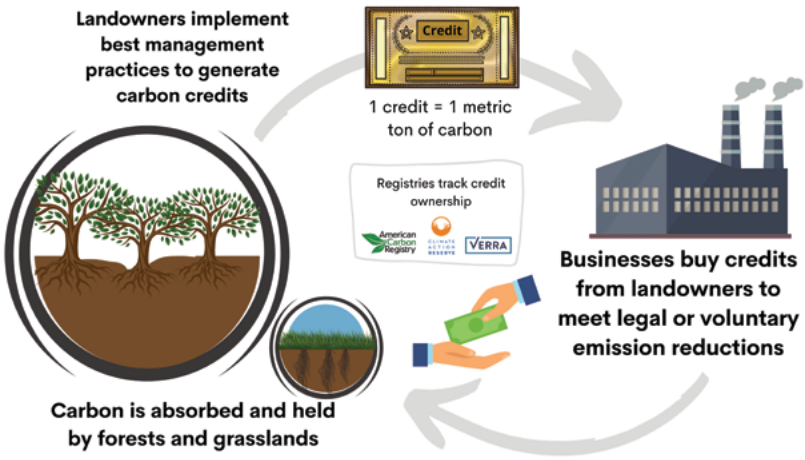
Offset: A reduction or removal of greenhouse emissions from the atmosphere that is used to compensate for an equivalent amount of emissions from another greenhouse gas-emitting activity occurring elsewhere. Offsets and ex-post carbon credits are often used interchangeably.

TYPES OF CREDITS

Ex-Post Carbon Credits

Ex-post carbon credits are commonly called *carbon offsets* and represent greenhouse gas reductions that have already occurred and are used to compensate for past greenhouse gas emissions elsewhere. They are typically generated in sectors where greenhouse gas emissions are not regulated and existing financial incentives to reduce greenhouse gases are lacking. For example, a carbon-crediting program issues forest project credits after verifying its increases in **carbon stocks**; the owner of that forest project can then sell those credits to a company to offset its greenhouse gas emissions for the past year.

CARBON MARKETS ECOSYSTEM



Ex-Ante Carbon Credits

Ex-ante carbon credits are issued upon the implementation of project activities that will produce greenhouse gas emissions reductions. Ex-ante credits represent *projected* greenhouse gas emissions reductions and are used to balance against anticipated future greenhouse gas emissions. Such forward-crediting creates a financial incentive for investments in actions that otherwise would not be economically feasible under an ex-post crediting framework. For example, reforestation offset projects have not yet reached scale in North America because developers are not able to recoup up-front costs for several years (sometimes as long as 12 years or more). Simply put, reforestation projects require significant upfront project development and verification costs, with **credit issuance** (and any revenues from credit sales) delayed until carbon stocks have increased enough to warrant undertaking the costly credit issuance process (in other words, the trees have grown tall enough and are removing enough carbon from the atmosphere to be worth issuing credits for).

Under an ex-ante framework, a carbon-crediting program may issue credits to eligible reforestation projects with the amount of credits based on projected increases in tree carbon stocks up until the point in time when the trees are likely to be harvested for their timber value. To make this approach feasible, ex-ante protocols need to be extremely conservative in calculating and crediting for net carbon benefits and include measures to safeguard project performance over time.

Carbon stocks: The amount of carbon stored on a per-unit area (i.e., acre) basis.

Credit issuance: Projects are issued carbon credits upon demonstration of carbon reductions or removals at required intervals via ongoing project monitoring, reporting and verification (MRV) by third-party verification bodies.

CALIFORNIA'S COMPLIANCE OFFSET MARKET

California regulates the largest North American compliance carbon offset market as part of its cap-and-trade program. California's Global Warming Solutions Act, also known as AB32, directed the California Air Resources Board (CARB) to develop a market-based plan that would cut greenhouse gas emissions to 40 percent of 1990 levels by 2030. The cap-and-trade Program covers approximately 85 percent of the state's greenhouse gas emissions and includes around 450 companies (known as covered entities) that emit more than 25,000 tons of carbon dioxide per year. The program's cap (or *emissions ceiling*) was set relative to the amount of emissions released if the entities made no changes (a "business-as-usual" emissions scenario) and declines over time.

The program requires covered entities to calculate their annual emissions and turn in compliance instruments in volumes equal to their reported emissions. There are two types of compliance instruments: emissions permits, called ***allowances***, issued by CARB and assigned a minimum price, and CARB-approved offsets, which generally trade at a 10–20 percent discount to the allowance price. The number of allowances available in the market decreases over time, reflecting the declining cap on total emissions. This system incentivizes companies to make direct changes to their operations to reduce emissions and consider buying offsets as part of a cost-effective overall compliance strategy. Offsets may be used to meet up to 8 percent of a company's reported emissions through 2020. Offsets are priced cheaper than allowances, primarily due to the risk of CARB invalidating the offsets if it determines a project is out of compliance within eight years of credit issuance.

Compliance offset projects must follow a strict set of rules to qualify for the California carbon market. First, they must be developed according to CARB-approved compliance offset protocols. Second, they must be **registered** with an approved **offset project registry**, such as the American Carbon Registry (ACR), Climate Action Reserve (CAR) or Verra (formerly known as the Verified Carbon Standard), before they can be converted into the compliance instrument known as Air Resource Board Offset Credits (ARBOCs) and sold. See chapter 4 for an overview of CARB's Forest Offset Protocol (FOP) and requirements by project type.

California Policy Trends and Market Considerations

In 2017, California's legislature extended the program into 2030 through the passage of Assembly Bill 398 (AB398) with some refinements to the program. These refinements will take effect for the years 2021–2030 and should be considered as land trusts and landowners assess market opportunities.

Under the new program, covered entities can use offsets to cover 4 percent of their annual emissions between 2021 and 2025 and 6 percent between 2026 and 2030.

Beginning in 2021, at least half the offsets used for compliance must come from projects that directly benefit California. There is uncertainty about how the California Air Resources Board (CARB) will determine which credits qualify for the "Direct Environmental Benefit" (DEB) designation. The designation may be based on jurisdictional geography (i.e., projects physically located in California) or on watershed geography, which means lands in neighboring states could qualify. The general market assessment errs on the conservative side by assuming that DEBs-eligible offsets will be those generated from projects located in California. Given that most compliance forest projects to date are outside of California, out-of-state forest projects may be competing for a smaller slice of the potential demand in future years.

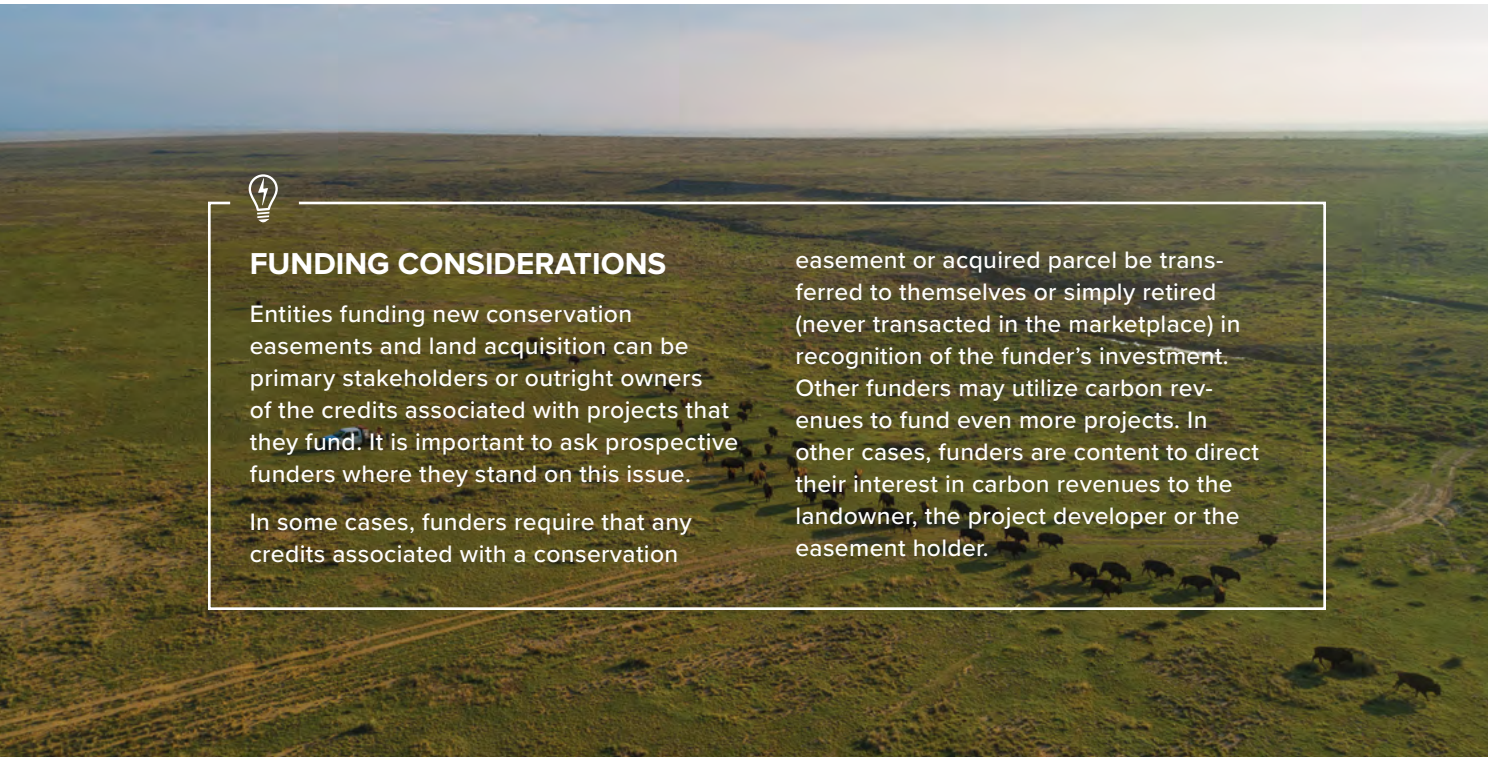
Opportunity for the Land Trust Community

Currently, forested lands represent the biggest opportunity for land trusts to participate in California's compliance market. The compliance Forest Offset Protocol was developed with working forests in mind and provides a financial incentive for a management approach that promotes greater volumes of biomass (more and/or larger trees) over the long term. Because forest carbon accounting stresses carbon storage in the forest, while also accounting for sequestration rates and the life cycle of carbon in wood products, it generally equates with contemporary standards of excellent forestry. Management practices incentivized by CARB's protocol encourage tree

Allowance: A government issued permit, equivalent to one metric ton of carbon dioxide, used in cap-and-trade programs where businesses must calculate and submit allowances equal in volume to their annual emissions. In a cap-and-trade program, the total number of allowances issued will decline over time. Allowances can also serve as a price signal to the market.

Registered: The status of a project when it has been verified by an applicable registry-approved and ISO-accredited verification body, all required documentation has been submitted by the project owner for final registry approval, and the registry has approved the project. A project is registered once, at the same time as the initial credit issuance to the project.

Offset Project Registry (OPR): A registry approved by the California Air Resources Board (CARB) to help administer parts of the Compliance Offset Program. Offset Project Registries help facilitate the listing, reporting and verification of offset projects developed using the Compliance Offset Protocols. They also issue registry offset credits, which cannot be used for compliance with the cap-and-trade program unless they are converted to ARB offset credits. ACR, CAR and Verra are carbon project registries approved to serve as Offset Project Registries for California's Compliance Offset Program.



FUNDING CONSIDERATIONS

Entities funding new conservation easements and land acquisition can be primary stakeholders or outright owners of the credits associated with projects that they fund. It is important to ask prospective funders where they stand on this issue.

In some cases, funders require that any credits associated with a conservation easement or acquired parcel be transferred to themselves or simply retired (never transacted in the marketplace) in recognition of the funder's investment. Other funders may utilize carbon revenues to fund even more projects. In other cases, funders are content to direct their interest in carbon revenues to the landowner, the project developer or the easement holder.

Bison herd in Heartland Ranch Nature Preserve. Photo courtesy of Environmental Defense Fund / Sean Boggs, photographer.

growth, high quality mature forest habitats for wildlife and larger dimension saw timber. As such, these projects are often complementary with land trust objectives of land conservation, habitat protection, water quality improvement and watershed resiliency.

VOLUNTARY CARBON MARKETS

Voluntary carbon markets are driven by concerned companies, organizations, municipalities and people who purchase carbon credits voluntarily to lower their own climate footprint. While voluntary actors may take ambitious climate actions, some emissions, such as those from airline flights, cannot be managed down to zero. As such, carbon credits serve an important role as a cost-effective tool that can secure greenhouse gas reductions from sectors that are not required to reduce their emissions and lack the financial incentives to do so.

Carbon registries issue and track more than 99 percent of the carbon offsets transacted on the voluntary market. Globally, there are five main voluntary carbon registries in operation, including American Carbon Registry (ACR), Climate Action Reserve (CAR), Gold Standard, Plan Vivo and Verra.

Based on Ecosystem Marketplace's "Financing Emissions Reductions for the Future—State of the Voluntary Carbon Markets 2019" report, the global voluntary market is valued at $295.7 million and can claim emissions reductions equivalent to 98.4 million metric tons CO_2e. This is a 49 percent increase in market value compared with 2016 and represents an all-time high since Ecosystem Marketplace began tracking the market in 2006. The report reveals that global market transactions from land use project types, such as forest and grassland projects, increased a staggering 264 percent in volume between 2016 and 2018. In comparison, volumes of other project types (such as renewable energy) grew just 21 percent.

Market Information

To date, the American Carbon Registry (ACR), Climate Action Reserve (CAR) and Verra have registered nearly 25 million credits to 40 active voluntary forest carbon projects and registered 173,375 credits to 13 avoided grassland conversion projects. While ACR and Verra also offer improved/restored wetland protocols, no credits have been issued to these project types in the US as of mid-2020.

Based on interviews with 15 land trusts and project developers, forest credits generated in the US and sold on the voluntary market fetch an average price of $6–$15 per metric ton, with outliers at $40+ per metric ton; while grassland credits fetch a similar average price of $6–$12 per metric ton, with outliers at $20+ per metric ton.

Factors Affecting Voluntary Credit Pricing

In the voluntary market, prices can vary as widely as $0.50 to $50 per metric ton for several reasons. Buyers may choose to pay more for specific project attributes they are seeking and negotiate unique contract terms directly with suppliers. Voluntary credit buyers value project type, location and environmental and social co-benefits associated with carbon projects. These factors reflect buyer

characteristics and their reasons for purchasing credits. For example, a company with factory operations in Oregon may pay more for credits sourced closer to home and even more for credits with additional benefits, such as new jobs or water quality improvements. The size of credit transactions also affects pricing. Credit transactions incur costs on both the supply and demand side, where finding buyers and projects, engaging in contract negotiations, legal fees, personnel time and paperwork can quickly add up. Because each transaction incurs the same costs, larger volume orders will generally see a discount compared with smaller transactions, which typically fetch higher prices per credit.

There are many ways to structure credit sales. Important factors for sellers to consider are verification costs, pricing, date of the credit issuance (**vintage**) and volume. Each project developer or landowner must decide which business model works best for them. Landowners may look for buyers who can purchase a portion of, or the entire volume from, a single **verification period** to cover the costs for that verification; or look for buyers who can commit to purchase the entire volume from multiple future verifications at a set price, providing certainty to both parties on the price, quantity, quality and timing of carbon credits. Some landowners may prefer to transact in larger volumes (e.g., the entire volume of a project's first credit issuance) to recoup start-up costs, and others may want to hold out for smaller boutique transactions, where the buyer has specific needs and will pay a premium price for credits.

The voluntary market invites financial innovation. For example, land trusts can consider creating a program in which community members can purchase credits to offset individual footprints, or leverage existing corporate relationships to secure capital financing for a project in exchange for credits once they are verified. Regardless of the sales strategy used, credit owners (sellers) transfer ownership of the credits, which have serial numbers for tracking, to the buyer or retire the credits on their behalf depending on contract specifications. Transfer of credit ownership entails moving the credit(s) between registry accounts. Once a credit is **retired**, it means it has been used to balance against emissions and is permanently taken off the market for circulation; a credit may only be retired once. Selling carbon credits requires specialized knowledge, including relationships with prospective buyers, contract development and an understanding of pricing dynamics in the market. Many landowners utilize service providers to assist with credit sales. See page 14 for more information on service providers and the case studies throughout this document for examples of how land trusts have engaged with buyers and service providers to facilitate project development and credit sales.

Emerging Markets

Advances in technology, financing and data availability, combined with the rise of more sophisticated buyers, sellers and others engaged in the carbon markets, are the driving force behind innovation. The hallmark of the voluntary market is the ability to increase climate action by seeking new ways to secure greenhouse gas reductions. In many ways, the voluntary market serves as an incubator for California's compliance market, which can be much more lucrative than the voluntary market. It is important for land trusts to understand and keep up to date on what types of projects can be registered where, so they have the option of registering their projects in the most lucrative market.

Climate Forward

In 2019, the Climate Action Reserve (CAR) launched Climate Forward, a new program designed to generate revenue for projects at their beginning stages and expand the scope of feasible greenhouse gas mitigation projects. Unlike the ex-post offsets framework, Climate Forward

Carbon project registry: An organization that establishes standards for quantifying and verifying greenhouse gas emission reduction projects, issues carbon credits and tracks the transfer and retirement of those credits in a publicly accessible online system.

Vintage: The year in which emissions reductions occur. The vintage of the credits may not necessarily be the same as the year the credits are issued or the year in which the credits are sold. Prices on the voluntary market often vary depending on the vintage.

Verification period: The period over which greenhouse gas reductions or removals are verified. A verification period may cover multiple reporting periods. The end date of any verification period must correspond to the end date of a reporting period.

Retired: The status of carbon credits when they are transferred to a retirement account in a registry system and removed from circulation. Retirement accounts are permanent and locked so that a retired credit cannot be transferred again. Credits are retired when they have been used to offset an equivalent metric ton of emissions or have been removed from further transactions on behalf of the environment.

uses an ex-ante framework and issues credits based on forecasted emissions reductions. Climate Forward credits are called Forecasted Mitigation Units (FMUs). One FMU represents one metric ton of projected CO_2e reduction. CAR recommends that companies use FMUs to match a stream of projected reductions against a stream of projected emissions from business operations. For example, companies may use FMUs to quantify the climate benefits of their sustainability investments and apply the credits against long-term climate goals.

California companies can also use FMUs to mitigate their emissions and meet the California Environmental Quality Act (CEQA). Under CEQA, any changes to land use (i.e., new residential community development) require a study of environmental impacts and mitigation measures. The California Air Resources Board (CARB) and the California Natural Resources Agency (CNRA) allow the use of carbon credits, like FMUs, to mitigate greenhouse gas impacts after feasible onsite (i.e., within the land use project area) reduction opportunities have been considered. Local agencies make final decisions on whether carbon credits are appropriate mitigation measures on a project-by-project basis.

Southern Plains Land Trust staff in the Heartland Ranch Nature Preserve.
Photo courtesy of Environmental Defense Fund / Sean Boggs, photographer.

New Market Demand

Although it is too early to tell exactly how the COVID-19 pandemic will impact offset demand, the pool of new voluntary buyers is expected to increase with time, thanks to several policy developments, a growing awareness of climate change and increasing numbers of individuals and businesses looking to take action. Domestically, new companies are cropping up with a focus on helping individuals and companies offset their carbon footprints. ClimateSeed, Co_2ol Effect, Stand for Trees, the Arbor Day Foundation and many more offer online retail platforms that help customers calculate their emissions footprint and select a project to offset that footprint. Recent private and NGO sector initiatives, commitments and bold announcements also demonstrate a clear buyer preference for purchasing carbon credits generated from land use projects:

- In April 2019, Shell Oil Company announced that it would invest $300 million in natural ecosystem-based offset projects over the next three years.
- The International Emissions Trading Association's Natural Climate Solutions Market Initiative seeks to expand private sector investments in these project types.
- Microsoft has committed to making significant investments in sequestration projects over the next 10 years.
- The events and entertainment industry are increasingly seeking offsets to compensate for emissions from major conferences, award shows, sporting events and stadiums.

In addition, the aviation industry's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) requires airlines to offset all emissions from international flights starting in 2027. Airlines can volunteer to participate in the program starting in 2021. While activity in the market will certainly increase, it is unclear how CORSIA may impact investments in US carbon projects given the global scale of the program. Credits issued by the American Carbon Registry (ACR), Climate Action Reserve (CAR) and Verra to projects that started after 2016, for reductions generated between 2016–2020, are eligible for the CORSIA market. The International Civil Aviation Organization will periodically determine additional eligible credits in phases throughout the program period.

ROLE OF CARBON REGISTRIES

Carbon registries safeguard the environmental and financial integrity of the carbon market so credit buyers can invest in carbon projects and be confident that their dollars are financing real greenhouse gas emissions reductions.

Carbon registries provide two essential functions in the marketplace. The policy function of a registry focuses on developing, maintaining and interpreting protocols to ensure carbon credits meet international standards. Registries also engage with stakeholders to monitor developments in science and technology and assess barriers to implementation of new carbon projects. Registries also provide governance and administrative functions, including review of project documentation to ensure it follows eligibility, monitoring, reporting and verification rules and to ensure this information is available on publicly accessible databases. Carbon registries also provide oversight and training of third-party verifiers and assess potential conflicts of interest for each project.

When a project is registered, it means it has met the program requirements for review and verification, and the registries issue a batch of credits equal to the quantified emissions reductions. Each carbon credit has a unique serial number assigned to it and, once credits have been used to balance against emissions, they are retired: in other words, permanently taken off the market. **Credit serialization**, public retirement reports and software controls for tracking are key aspects of a high-quality registry. The carbon registries most active in the United States are the American Carbon Registry (ACR) and Climate Action Reserve (CAR); both are registered 501(c)(3) not-for-profit organizations. There are also global voluntary carbon registries, such as Gold Standard, PlanVivo and Verra, which operate several voluntary programs primarily focused on supporting projects in developing countries and emerging markets.

Serialized credits: Carbon registries issue unique serial number identifiers to each carbon credit they register to ensure that each metric ton of emission reductions is counted and retired only once.

Downeast Lakes Land Trust's community forest. Photo courtesy of Grace Croonenberghs of Downeast Lakes Land Trust.

02

PROJECT DEVELOPMENT PROCESS AND SERVICE PROVIDERS

Developing a forest carbon project can take about two to five years from the initial feasibility study and education phase to the first credit issuance and sales step. Once a carbon project is past the first credit issuance phase, managing the project into the future is less intensive and requires fewer resources than the initial project development. For voluntary projects, project developers typically work to secure credit buyers before committing resources to project development, which adds time to the feasibility and project planning phase. Timing for credit issuance also varies significantly between compliance and voluntary projects. Registries generally issue voluntary credits in a matter of weeks, whereas compliance projects require an additional review step by the California Air Resources Board (CARB) to convert registry offset credits (ROCs) into ARB offset credits (ARBOCs), which takes about six or seven months, on average, for forestry projects.

Table 2-1 describes the project development process from initial project scoping to the first credit issuance (project registration). The steps in green are activities that are repeated throughout a project's lifetime per monitoring, reporting and verification (MRV) requirements and ongoing credit issuance. The time frame for future credit issuance is typically shorter after the first credit issuance.

SERVICE PROVIDERS

If all of this seems complicated and overwhelming, don't worry! There are people who can help. In fact, an entire industry of service providers exists to help landowners

KEY ENTITIES TO KNOW WHEN SELLING CARBON CREDITS

Broker. An entity that works as an intermediary and does not take ownership of credits but facilitates transactions (for a fee) between landowners or project developers and end users or retailers. Some retailers will also perform this role, but generally not at significant volumes.

Retailer. An entity that contracts with a landowner or project developers to take ownership of a portfolio of carbon credits that it then offers to end buyers. Retailers typically offer other corporate sustainability services. Many retailers also offer project development and management services.

End buyer. A buyer who purchases carbon credits to retire them as a balance against their own greenhouse gas emissions.

Newtown Forest Association. Photo courtesy of DJ Glisson II, Firefly Imageworks.

with every aspect of a carbon project. Carbon project service providers include companies, nonprofit organizations and consultants that can assist with feasibility assessments, cost benefit analysis, project financing, credit sales, project administration and ongoing management, marketing and communications, education, legal support (such as contract review), and technical support (such as inventory development). Consultants and project developers both provide technical support, but project developers generally also provide financial support and credit-marketing assistance. The business models for each differs. Project developers typically take a revenue share, while consultants are typically paid professional fees for their time. Comparing risks and financial benefits between project developers can be challenging because deals can be structured in a variety of ways. It is important to understand what costs and revenues are estimated versus fixed and what are the net versus gross revenues when conducting due diligence. When project developers cover upfront costs for project development, they are taking on the full financial risk until projects are registered or credits are sold. If credits are sold before the project is completed, the project developer may also take on the risk associated with fulfilling contractual deliveries to credit buyers. For projects that require conservation easements, such as avoided grassland conversion projects, some project developers provide cash upfront to help pay for conservation easements, followed by revenue sharing with the landowner or easement holder after the initial investment is recouped.

TIPS FOR CONDUCTING DUE DILIGENCE

For every project, land trust due diligence includes asking consultants or project developers important questions and being satisfied with the responses. Key questions include:

- What is the product generated (e.g., an offset [if so, what type?], a carbon cost share payment, an annual carbon lease for deferred harvest)?
- Will all the calculations, original data and supporting documents used to develop the project be turned over to the land trust for continued project management and monitoring after the development contract is concluded? This information is critical for long-term monitoring, reporting and even continual verification.
- What are the commitments and for how long?
- How is the deal structured? There are two common payment options. In the first case, a buyer guarantees they will buy the credits at a set price before a project is developed, which reduces uncertainty for both the buyer and seller. The second option is full consignment, where the credits are sold after they are registered on the carbon market for the highest price that can be negotiated.
- Who pays for what costs and when? What are the terms (i.e., pricing, volume, term, fees)?
- Is the program fully baked or is the land trust being asked to commit to something in development? Is the proposed registry recognized as reputable?

DEVELOPMENT PROCESS FOR CARBON PROJECTS

PHASE 01

Feasibility assessment and project planning
(1–2 years)

STEP 01

Scoping

ACTIVITIES

- Identify applicable markets and protocols
- Reach out to service providers to evaluate technical support and financing options
- Engage and educate stakeholders
- Review and select a market and protocol: Is a carbon project and its requirements for land management compatible with the property and long-term plans?

STEP 02

Eligibility assessment

- Assess any existing easement provisions and how they affect a project's additionality and/or baseline
- Determine clear property ownership and property boundaries
- Identify project partners (i.e., project developers, technical consultants) and/or assess aggregation/cooperative opportunities

FOREST

- Assess geographic eligibility; determine and identify applicable common practice values
- Consider installing test plots to estimate actual carbon inventory and inform cost/benefit analysis

GRASSLAND

- Assess financial threshold and soil suitability for conversion to cropland
- Assess land-use history and identify supporting documentation

STEP 03

Cost-benefit analysis

FOREST

- Perform baseline modeling and estimate actual carbon stocks (initial inventory)

GRASSLAND

- Identify project soil strata

- Assess crediting and revenue potential and access to buyers, including project feasibility and management tools offered by carbon programs
- Perform long-term financial planning (i.e., consider allocating percentage of revenue for long-term project MRV costs; identify risk mitigation measures and costs, such as a set-aside fund as legal reserve)

PHASE 02

Project development
(1–2 years)

STEP 01

List project

- Open registry account
- Complete and submit project **listing** forms
- Determine initial and ongoing project management structure; consider a multi-year management plan, reflecting MRV requirements (e.g., 6–12 years) and credit issuance and sales frequency/opportunity

Listed: The status of a project once the project owner has created an account with a carbon registry and submitted the required forms and documents and the registry has approved and accepted the project for listing.

PROJECT DEVELOPMENT PROCESS AND SERVICE PROVIDERS

PHASE 02 **Project development** (1–2 years)	**STEP 02** **Quantify project credit amount; prepare project monitoring documents**	**ACTIVITIES** **FOREST** ▸ Design inventory methodology ▸ Calculate baseline and actual onsite carbon stocks ▸ Determine baseline and actual carbon in harvested wood products **GRASSLAND** ▸ Confirm project data inputs (soil texture, MLRA, etc.) ▸ Calculate project emissions (animal grazing days, fuel use, etc.) ▸ Negotiate terms of conservation easement and record easement (may be part of project-listing phase)
		▸ Quantify secondary effects ▸ Determine buffer pool contribution ▸ Calculate net greenhouse gas reduction and removals ▸ Prepare monitoring plan and monitor all required project parameters
	STEP 03 **Complete project reports for credit registration**	▸ Complete documentation for project registration, including a comprehensive project design, inventory methodology (for forest) and calculation description documents ▸ Submit calculation tools, GIS data files, attestation of title documentation
	STEP 04 **Conduct monitoring, reporting, verification**	▸ Select a verifier to review and affirm project documents and confirm credit amount ▸ Perform ongoing monitoring and report project performance on an annual basis per protocol/methodology requirements
PHASE 03 **Project registration** (~1 month or less)	**STEP 01** **Register, issue credits**	▸ Registry reviews documents, executes any program agreements (variable by carbon program) and issues credits
PHASE 04 **Compliance projects only** (~6–7 months on average)		▸ Submit project for CARB review to convert ROCs to ARBOCs
PHASE 05 **Credit sales** (variable; may be immediately to 1 year or longer, depending on project business model)	**STEP 01** **Deliver or retire credits**	▸ Deliver credits to buyer by transferring credits into buyer accounts as needed, or retire credits on behalf of buyer in the registry—subject to private contract provisions

03

PROTOCOLS AND METHODOLOGIES APPLICABLE TO LAND TRUSTS

This chapter describes key crediting concepts for sequestration projects. It also provides a comparison of forest and grassland protocols and an overview of wetland and soil carbon project types. Before starting a project, land trusts need to know the following:

- Their commitments (annual reporting, for example)
- What lands can be included in a project
- What are eligible project activities and how long they must be maintained
- What their crediting (and therefore revenue) could be

Once land trusts have a basic understanding of this information, they can work on their own or with a project developer to identify the crediting program that would best fit their circumstances and goals.

LAND TRUST AND PROJECT COMMITMENTS

Carbon credits are used to balance against greenhouse gas emissions reductions, which means whatever emissions reductions a project receives credit for must effectively remain out of the atmosphere permanently.

Monitoring, reporting and verification (MRV) are crucial to ensuring and documenting this result. On-site verification by a registry-accredited third party is required for a project to be registered and issued credits. Different carbon programs require varying frequencies of site visits, ranging from only during the first verification (grasslands and ex-ante reforestation) to five to six years for forestry projects. In addition to **onsite verifications**, **project owners** may choose to perform **desk verifications** in between the required site visits. Desk verifications generally entail a third-party review of project documents, inventory and timber harvest reports and quantification

Project owner: The entity responsible for undertaking a project and registering it with a carbon program. This entity is responsible for executing agreements with the registry and for the ongoing management requirements of the project. Different carbon programs use different terms to describe the entity ultimately responsible for the carbon project. See Tables 3-1, 3-5 and 3-6 for information regarding which entities may assume the role of project owner. The project owner may be the same entity as the project developer. Equivalent terms for each carbon program:

- CARB and CAR's improved forest management protocol (forestry): offset project operator
- ACR and CAR's Climate Forward Program: project proponent
- CAR's AGC protocol (grassland): project developer

Onsite verification: A site visit to the project area, in addition to the desk verification.

Desk verification: A review of project documentation, project inventory reports and the methods used to calculate the number of carbon credits to be issued.

Buffer pool: A holding account for carbon credits from sequestration projects, administered by individual registries. It is used as a general insurance mechanism against unavoidable reversals for all sequestration projects within a carbon program. For example, if a forest project experiences an unavoidable reversal of greenhouse gas reductions and removals (such as trees lost due to a forest fire), the registry will retire credits from the buffer pool equal to the total amount of carbon that was reversed (measured in metric tons of carbon dioxide).

of credits. The advantage of adding desk verifications is that owners can receive additional credits sooner and at a lower cost because the verifier does not have to travel to the property and conduct field measurements.

Under the California Air Resources Board (CARB) and Climate Action Reserve (CAR) programs, the credit permanence standard is 100 years, meaning the MRV requirement is 100 years for each credit issued. Thus, if a project is issued 500 credits after year one, it must maintain 500 metric tons more carbon than its baseline for at least the next 100 years. If the project is issued 200 more credits for sequestration after the third year, the project must maintain 200 metric tons more carbon for another 100 years, extending the monitoring, reporting and verification commitment to 103 years. This requirement ensures that each credit issued under CARB and CAR's program meets the 100-year permanence standard. Under the American Carbon Registry (ACR) program, the minimum project commitment is 40 years, at which time monitoring, reporting and verification requirements cease. Under ACR's program, a forest project may be issued credits for up to 40 years, consisting of two 20-year crediting periods. To receive credits for the second crediting period, a project must be revalidated and verified.

To ensure the permanence of the credited greenhouse gas reductions, protocols include an insurance mechanism to compensate for reversals—the release of carbon back into the atmosphere whether due to unavoidable natural disturbances (e.g., wildfire) or due to avoidable human activity (e.g., excessive harvesting). In the case of avoidable disturbances, project owners are required to compensate for the reversal by retiring credits in equal or greater volume. For unavoidable disturbances, carbon program registries will retire credits from a program-wide risk **buffer pool** where all sequestration projects contribute a percentage of credits, creating a shared insurance mechanism for all projects in the program. The buffer pool contribution percentage varies by program and project type, ranging from 2 to 29 percent, depending on project characteristics.

While offsets are a key strategy to mitigate greenhouse gas emissions, perverse opportunities exist for financial profiteering that land trusts need to be aware of when conducting due diligence for a carbon project. Carbon projects have a set of best practices to ensure that offsets are real, additional and permanent climate change solutions.

One best practice is associated with how buffer pools are managed and maintained to ensure that in the case of carbon reversal the promised carbon storage is still realized. Specifically, some offset program registries provide flexibility to either use credits generated from the project for the buffer pool (best practice) or to substitute credits generated outside the project. In some cases, these credits are from any past carbon offset project, regardless of year, project type or quality of offset. This mechanism was originally designed for programmatic flexibility; however, there is now a growing trend within the offset industry, particularly with forest offset projects, to take advantage of this flexibility as a standard matter of course when projects are first registered. This practice frees up the higher value buffer tons from the new project, thereby generating improved project returns in the near term, a practice known as *buffer ton arbitrage*.

While substituting alternative lower cost credits into the buffer pool is appealing from a revenue generation perspective, it is problematic from a conservation standpoint because the replacement credits can provide a lower value of environmental and societal co-benefits and can weaken the integrity of offset programs. For example, an improved forest management project has co-benefits that include increased wildlife habitat, water quality, outdoor recreation and aesthetics. Non-forest projects (such as capture of methane generated by farm animals through an anaerobic digester) do not produce these same benefits, and credits from forestry projects generally receive a significant price premium because of their co-benefits. The intentional use of non-forestry credits to release a project's forestry buffer pool credits solely to increase revenue generation is misleading and results in mixed forestry and non-forestry buffer pools at the project level. This erodes the co-benefits unique to forestry projects and jeopardizes public perceptions of forest carbon project integrity.

LEAKAGE

Leakage is the shifting of the baseline activity and associated greenhouse gas emissions to areas outside the project area. For example, reducing timber harvests in a forest project area may mean harvesting increases outside the project area to meet the same overall wood product demand. To address this issue, protocols require the project developer to assess this risk over the project's lifetime, which is known as a *leakage discount* and is applied to the project's greenhouse gas reductions. Higher leakage discounts mean lower carbon credit yields, and therefore, a project will generate less money. Each protocol calculates the discounts differently.

CONSERVATION EASEMENT CONSIDERATIONS

Just as every conservation easement is unique, so is every carbon project. Combining a carbon project with a conservation easement can help make the latter—an already highly effective conservation tool—into an even more important strategy in the fight against climate change. Indeed, conservation easements provide a time-tested and reliable way to ensure the permanence of the climate benefits generated by a carbon project. Although the overall conservation goals of each land trust remain paramount, it is important to consider the potential for future or current carbon projects during an easement's development. To that end, the Alliance created a companion document, *Carbon Offsets in Conservation Easements: The Essentials for Land Trusts*, which provides practical guidance for land trust practitioners in considering carbon projects on conservation easement-protected land. The document includes the latest thinking on drafting conservation easement language to (1) allow the development of carbon projects and (2) convey or clarify the ownership of the carbon credits generated by such a project.

FORESTLAND

There are three different protocols that govern forest carbon projects: Forest Management; Avoided Forest Conversion; and Afforestation/Reforestation. In addition to conservation and stewardship benefits, land trusts currently enrolled in carbon programs point to the forest data from the carbon inventory, synergies with easement monitoring requirements and the ability to create an additional stream of revenue from the land base as additional benefits of developing forest carbon projects.

Protocols for Forest Management and Avoided Forest Conversion

Forest management protocols are designed to encourage sustainable management practices that maintain and/or enhance the sequestration potential of a forest in comparison to a business-as-usual scenario. Forest management projects are often characterized by or encourage forests that are more resilient to the impacts of climate change, are managed for multiple benefits beyond timber production, have high biomass volumes, have larger and older trees, maintain high growth rates and often result in higher production of wood products over the project's lifetime. These project types also include avoiding the conversion of forestland for alternative land uses, such as commercial, agricultural or residential uses.

Typical activities for projects focused on enhancing carbon stocks through improved forest management include one or more of the following:

- Growing older forests with fewer or no harvests over time
- Improving forest health in ways that lead to stocking improvements
- Retaining more mature reserve trees within harvest units
- Increasing riparian zone buffer distances or minimum stocking levels beyond what is required
- Establishing no-cut reserve stands
- Extending the time (rotations) between harvests so trees are larger and older when they are logged
- Retaining the best-growing trees
- Avoiding damage of retained trees at harvest
- Minimizing non-forest areas (roads and landings)

There is no set list of required management practices.

Crediting period: The period over which a project's greenhouse gas reductions are eligible to be verified or confirmed and issued carbon credits. Crediting periods are limited to ensure that a project's baseline remains credible.

Great Land Trust (AK). Photo courtesy of DJ Glisson II, Firefly Imageworks.

3-1. Table Forestland Protocols Comparison

	CARB: US Forest Compliance Protocol	ACR: Improved Forest Management for Nonfederal US Forestlands	CAR: Forest Project Protocol	CAR: Climate Forward Mature Forest Management Forecast Methodology
	Ex-post	Ex-post	Ex-post	Ex-ante
Location	• Private/nonfederal public lands in continental US and Alaska. • Projects located on tribal lands must include a waiver of sovereign immunity for the project area. • Project area may not change.	• Nonfederal US forestlands.	• Private/nonfederal public lands in all 50 US states and US territories, in certain instances. • Allows for partial removal of project area.	• Private lands in all 50 US states. • Requires perpetual conservation easement. • Single 100-year crediting period, secured by perpetual conservation easement.
Project ownership[1]	• Offset project operator must be a forest owner with demonstrated legal control of the trees. • Permits consolidation of multiple land holdings with multiple fee owners into a single project. • Only one forest owner may be issued credits and be responsible for project management; all forest owners involved are liable for reversal risk.	• Project proponent: an individual or entity that undertakes, develops and/or owns a project. Project proponent and landowner/facility owner may be different entities. • Permits consolidation of multiple land holdings with multiple fee owners into a single project.	• Offset project operator must be a forest owner. • Forest owner: entity with legal control of trees. • May have multiple forest owners (i.e., easement holder) but there can be only one fee owner. • Does NOT permit consolidation of multiple land holdings with multiple fee owners into a single project.	
Aggregation	• Individual projects may NOT group together to form an aggregate.	• Individual projects may group together to form an aggregate but must follow ACR's aggregation or development aggregation guidance.	• Individual projects may group together to form an aggregate, but must follow CAR's aggregation guidance.	• Does not permit aggregation of multiple projects with multiple fee owners.
Improved forest management additionality	• Project activity cannot be mandated by law. • Project activity must exceed a baseline informed by a common practice CO_2e value, an assessment of a financial feasibility test and any legal constraints.	• Project activity cannot be mandated by law. • Project activity must exceed a qualitative assessment of common practice in the region.	• Project activity cannot be mandated by law. • Project activity must exceed a baseline informed by a common practice CO_2e value, an assessment of a financial feasibility test and any legal constraints.	

3-1. Table Forestland Protocols Comparison (cont.)

	CARB: US Forest Compliance Protocol	ACR: Improved Forest Management for Nonfederal US Forestlands	CAR: Forest Project Protocol	CAR: Climate Forward Mature Forest Management Forecast Methodology
	Ex-post	Ex-post	Ex-post	Ex-ante
Improved forest management baseline	• Project baseline: modeling of initial carbon stocks for 100 years of growth and harvesting. • For private lands, the project baseline must be above Common Practice[2] (CP) or set at initial carbon stocks level if initial stocks are below the CP. • Public lands develop a baseline based on 10-year historical trends and current public policy.	• Project baseline: net present value (NPV) maximization, with a variable discount rate (by ownership class) on future cash flows. • The baseline is a project-specific approach that maximizes NPV of perpetual wood products, while adhering to all applicable laws and regulations.	• Project baseline: modeling of initial carbon stocks for 100 years of growth and harvesting. • The project baseline may not go below common practice unless initial carbon stocks begin below common practice (in which case, initial carbon stocks are the baseline). • Option for private lands to use a default baseline that does not require modeling. • Nonfederal public lands develop a baseline using Carbon OnLine Estimator (COLE).	N/A
Avoided conversion additionality	• Project activity cannot be mandated by law. • Anticipated land use conversion must be legally permissible. • A real estate appraisal must show the alternate land use has a higher market value than forestland.	N/A	• Project activity cannot be mandated by law. • Anticipated land use conversion must be legally permissible. • A real estate appraisal must show the alternative land use has a higher market value than forestland.	N/A
Avoided conversion baseline	• Project baseline depends on the alternative land use. • Projects can use project-specific documents (such as construction plans) or default rates of conversion from the protocol.	N/A	• Project baseline depends on the alternative land use. • Projects can use project-specific documents (such as construction plans) or default rates of conversion from the protocol.	N/A
Natural forest management	• Requires Forest Stewardship Council, Sustainable Forestry Initiative or American Tree Farm System certification with even-aged harvesting. • Projects must meet native species criteria within 25 years. • Restricts even-aged harvesting practices to 40 acres.	• Requires Forest Stewardship Council, Sustainable Forestry Initiative or American Tree Farm System certification if commercial harvesting occurs in project area.	• Requires Forest Stewardship Council, Sustainable Forestry Initiative or American Tree Farm System certification. • Must meet native species criteria within 50 years. • Flexible options for monitoring and management of structural elements. • Flexible restrictions around even-aged management based on post-harvest retention.	• Sustainable management demonstrated by conservation easement, including terms related to timber harvest specified in the methodology. • Species composition requirements must be met.
Project commitment	100+ years	40 years	100+ years	1 year after project implementation with 100-year permanence as secured by a conservation easement.

1 Different carbon programs use different terms to describe the entity ultimately responsible for the carbon project. For comparison, this report uses the term *project ownership/owner*, which is equivalent to CARB's *offset project operator*, ACR's *project proponent* and CAR's *offset project operator* (forest) and *project owner* (grassland).

2 CARB and CAR's Common Practice (CP) value is based on US Forest Service Forest Inventory Analysis data. The CP value is representative of the average carbon stocking on private forestland at the regional level by forest type.

CASE STUDY

Appalachian Mountain Club, Voluntary Improved Forest Management Project: Katahdin Iron Works Ecological Reserve

Formed in 1876, the Appalachian Mountain Club (AMC) is the oldest conservation and recreation organization in the country. Today, AMC includes 90,000 members, spanning 12 member chapters across the northern Appalachians with headquarters in Boston. The organization is a nonprofit landowner, stewarding 75,000 acres in central Maine that it manages for recreation and conservation, with over a third of the land permanently designated as ecological reserves and about 40 percent under active timber management and harvesting.

AMC's journey into the carbon market began when it started thinking about organizational sustainability in the early 2000s, with the goal of becoming a carbon neutral organization. When Climate Action Reserve (CAR) developed its improved forest management protocol for California's compliance program, several project developers approached the organization in 2009 to provide free assessments on the potential financial return if AMC were to enroll in California's compliance carbon program. AMC ultimately decided to move forward with project development in-house with consulting support from the Pacific Forest Trust, an accredited California land trust whose leadership played an important role in the development of the early action improved forest management protocol and was shepherding its own carbon project through initial credit issuance.

Easement Considerations

AMC originally intended to develop the project for the California compliance program, with a conservation easement held by the Maine Department of Conservation. The easement included a standard provision that stated that the activities on conserved land could not lead to increased pollution elsewhere, essentially allowing Maine to retain regulatory control of pollutants. While the provision was not intended to prohibit carbon project development, the easement holder decided that participation in a compliance program would violate easement terms by creating a legal entitlement for a compliance entity to pollute. A voluntary carbon program, on the other hand, would not have that effect because the action to purchase carbon credits would be driven by voluntary commitments instead of a compliance obligation.

West Branch Pleasant River within CAR646 project area. David Publicover, photographer.

3-2. Table
Katahdin Iron Works Ecological Reserve

Project structure	• AMC is the project operator, project developer and landowner. • Maine Department of Conservation (now Department of Agriculture, Conservation and Forestry) is the conservation easement holder.
Roles and service providers	• Pacific Forest Trust provided consulting services, including acting as a liaison with CAR, assisting with inventory design and carbon stock calculations and providing guidance on marketing of credits • External consultants were engaged for baseline and future growth modeling and to provide legal services. • AMC continues to manage this project in-house.
Project specifications	• Registered with CAR. • 9,037 acres of forestland in central Maine. • Project start date is March 22, 2007, the date the conservation easement was recorded. • Primary species are sugar and red maple, beech, white and yellow birch, red spruce, balsam fir and northern white cedar. The project area has a long history of commercial timber harvesting dating back to the 1870s. As a result, most of the project area is in an early- to mid-successional condition with few old stands.
Easement specifications	• The conservation easement serves as the initiation of the carbon project, with the recording date as the project's start date. • The conservation easement prohibits commercial harvesting within the project area and includes a standard provision that states that the activities on the conserved land cannot lead to increased pollution elsewhere, essentially allowing Maine to retain regulatory control of pollutants. This clause inadvertently impacted the project's ability to purse compliance grade credits. The project was eligible for the voluntary market, given that the action to purchase carbon credits would be driven by voluntary commitments instead of a compliance obligation.
Credits issued	• 165,137 credits registered to date; 5,346 credits estimated annually.

Costs	• Primarily developed with support from one staff person over the course of four years. Two other senior staff were involved in an advisory capacity.
	  ◦ Project development cost: ~$150,000, including staff time, inventory, modeling, documentation, registry fees and legal expense
	  ◦ Initial third-party full verification cost: $19,000
	  ◦ Ongoing maintenance: $11,500 for initial desk verification, $19,000 for full verifications; $4,500 for subsequent desk verifications

Credit sales structure	• Credits sold to The Climate Trust, as part of a futures contract that ended in 2019. AMC is assessing how it may want to sell/use credits from the next reporting period (2020 and beyond).
Project benefits	• The carbon project is part of a new conservation model that achieves multiple goals aligned with AMC's mission and allows the land to be financially self-sufficient with revenue streams from timber harvesting, recreational services and carbon credit sales. • The project served to build internal capacity for forest management and carbon projects and positioned the organization as a leader and innovator.
Lessons learned	• Board required significant education to understand carbon markets and program commitments. • Understanding conservation easement provisions is critical. • Carbon projects require strong organizational structures to maintain long-term obligations. • Provides a pathway to engage with the public about sustainability.

Reporting period:
A discrete period over which a project's greenhouse gas reductions are quantified and reported to a registry.

View from Snooper's Rock. Courtesy of Tennessee River Gorge Trust / Petra and Gunter Porzer, photographers.

CASE STUDY

Tennessee River Gorge Trust, Compliance Improved Forest Management Project

The Tennessee River Gorge Trust (TRGT) was formed in 1986 with a mission to preserve the Tennessee River Gorge as a community resource through land protection, education and stewardship. The land trust has protected more than 17,000 acres in the gorge, including fee ownership of over 6,230 acres.

In 2013, executive director Rick Huffines started investigating carbon market opportunities. After learning more about the California cap-and-trade program and the potential for carbon offsets, Huffines and board president Dean Poi undertook a 13-month research and education process, including installing 22 test plots for an initial assessment of carbon stocks on TRGT's fee-owned land.

The land trust worked with Finite Carbon, a carbon offset developer and supplier, which provided a free project feasibility assessment, using the test plot data to inform an estimate of potential returns if TRGT were to move forward with a project. Ultimately, TRGT developed a project with Finite Carbon. Finite Carbon provided upfront costs for inventory development and verification, project management and technical services and connected TRGT with a compliance credit buyer. TRGT registered its project in 2017, and credits were transacted immediately after registration. The land trust netted over $2 million after paying Finite Carbon's fees with a percentage of the credits issued, as well as legal fees for credit sales contract review.

The land trust also set up a designated fund with a portion of the credit sales revenue to pay for ongoing project management costs, such as annual reporting, monitoring and required verifications. It was also able to more than double its 2013 general operating fund income and rely on ongoing revenue from the carbon project to pursue long-term strategic planning. As a result, TRGT plans to invest in initiatives focused on inclusivity and diversity and is also scoping voluntary market opportunities in support of private and university landowners in its region.

3-3. Table
Tennessee River Gorge Trust, Compliance Improved Forest Management Project

Project structure	• TRGT is the offset project operator and landowner. • Finite Carbon is the project developer.
Roles and service providers	• Finite Carbon provided capital investment, project management services and facilitated credit sales.
Project specifications	• Registered with California Air Resources Board (CARB). • 5,615 acres. • Project start date is February 12, 2015, the start of project inventory development. • The project area is primarily dominated by oak-hickory and, to a lesser extent, mixed hardwood forest types.
Credits issued	• 369,828 ARBOCs registered to date.
Costs	• ~$5,000 for 22 test plots. • Finite Carbon provided full capital investment. • Initial project development involved significant staff time. • Annual project management requires minimal staff resources, about 80 hours/year.
Credit sales structure	• Worked with the same compliance buyer for two transactions of entire project credit issuances. • Finite Carbon was responsible for securing a buyer for the first credit issuance as part of its services.
Project benefits	• Provided new revenue source for land stewardship. • Gave the organization long-term financial security. • Ability to invest in innovative initiatives aligned with TRGT mission. • Positioned TRGT as a leader in conservation and increased its ability to support landowners in its region. • Positive marketing and name recognition for a small organization.
Lessons learned	• Invest in early engagement with board members through an educational process. • Find a good project developer. • Be thoughtful about how to promote the carbon project and how it supports conservation. • Understand any project's long-term commitments, including any long-term financial planning needed to support it. • Research the differences between compliance and voluntary programs, commitments and understand terminology. • Know what is in your deeds and the location of your property boundary lines.

CASE STUDY

Downeast Lakes Land Trust, Compliance Improved Forest Management Project: West Grand Lake IFM

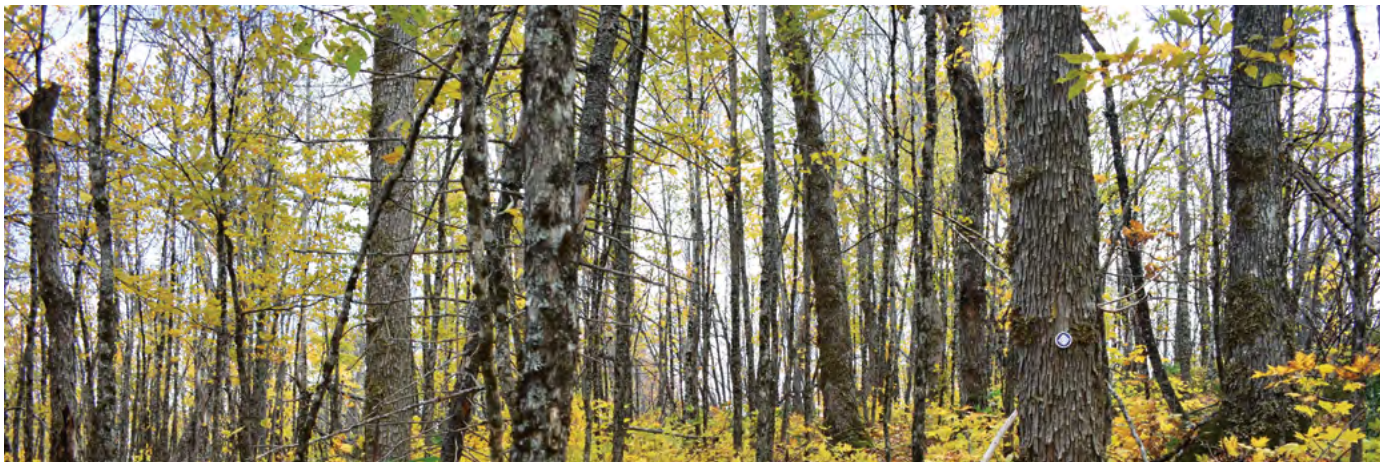
Downeast Lakes Land Trust (DLLT), located in Grand Lake Stream, Maine, is focused on land protection, fish and wildlife habitat improvements and public education. DLLT is the project owner of two compliance improved forest management carbon projects registered with Climate Action Reserve (CAR) and one voluntary improved forest management project registered with the American Carbon Registry (ACR). This case study focuses on DLLT's West Grand Lake compliance improved forest management project and the role of its first carbon project, Farm Cove IFM, in the conservation and acquisition of 22,000 acres near West Grand Lake Stream.

DLLT developed a layered financing strategy that incorporated carbon revenue by leveraging its fee-owned land. The effort supported a $19 million capital campaign to conserve and purchase 22,000 acres that became available in the heart of the Downeast Lakes region of Maine. DLLT approached Lyme Timber Company, a private timberland investment manager, to purchase the property as part of the finance strategy, in which conservation and eventual land trust ownership occurred in two phases. To finance the first phase, DLLT worked with Finite Carbon to develop the Farm Cove Community Forest as a compliance project on 19,100 acres of its fee-owned land. Carbon revenue from the Farm Cove project, along with funding from the State of Maine, the Forest Legacy Program and philanthropic foundations, enabled DLLT to purchase a conservation easement on the West Grand Lake property. DLLT transferred the easement to the Maine Department of Agriculture, Conservation and Forestry when the land trust subsequently acquired the underlying fee interest in the land.

To raise the additional funding needed to complete the purchase of the land, a compliance carbon project was developed on the West Grand Lake property with initial revenues distributed between Lyme Timber, GLS Woodlands (an entity created to hold the property) and the land trust. DLLT is now the landowner and project owner of the West Grand Lake carbon project.

Easement Considerations

The conservation easement on West Grand Lake did not include any volume retention requirements or maximum harvest requirements, and the stewardship plan, as part of the Forest Legacy Program, also did not include any harvesting restrictions. This meant that the property was still eligible to be developed as a carbon project.



Downeast Lakes Community Forest. Photo courtesy of Downeast Lakes Land Trust.

3-4. Table
West Grand Lake Improved Forest Management Project

Project structure	• GLS Woodlands was the original offset project operator, but the project was transferred to DLLT when it purchased the fee title. • The conservation easement holder is the Maine Department of Agriculture, Conservation and Forestry.
Roles and service providers	• Finite Carbon is the project developer. • External consultants provided legal services.
Project specifications	• Registered with CAR and the California Air Resource Board (CARB). • 19,551 acres. • Project start date is September 30, 2013, the start of the project inventory development. • Comprised mostly of spruce-fir and northern hardwood forest types. • About 4–5 years from scoping opportunities to ARBOC issuance and sale. • Finite Carbon provided capital investment, project management services and facilitated credit sales. • DLLT's forester and president are responsible for working with Finite Carbon to report data on compliance carbon projects, requiring about 5% of their time each year.
Credits issued	• 671,801 credits registered to date. • 20,000 estimated annual credits issued.
Resources and costs	• Going forward, DLLT will seek external support for project maintenance.
Credit sales structure	• Finite Carbon provides full transaction services for DLLT; Finite solicits bids and the land trust decides on a buyer. DLLT directly negotiates terms of sale with the buyer. • To date, entire volume from each issuance has been purchased by a single buyer.
Project benefits	• The conservation easement requirement for third-party sustainable forestry certification helped DLLT comply with the requirements of the carbon project. • The detailed inventory requirements of the carbon project gave the land trust fine-scale data that helped improve the property's timber management. • Revenue from the subsequent credit sales will potentially support a new staff position.
Lessons learned	• Finding legal counsel that is familiar with carbon programs can be difficult. Credit transactions are time-consuming and can include educating legal counsel on carbon programs and transactions. • Work with the board early on to understand long-term commitments, risks and obligations, and conceptual hurdles with external parties like project developers. • Ensure the credit sales contracts with compliance buyers include strong mediation and arbitration clauses in the event of a dispute. • Set aside funds from credit sales for long-term project maintenance expenses and a legal reserve for risk mitigation in the event of any future litigation.

3-5. Table Afforestation/Reforestation Protocols Comparison

	CARB: US Forest Compliance Protocol	ACR: Afforestation and Reforestation of Degraded Land	CAR Climate Forward: Reforestation Project Forecast Methodology
	Ex-post	Ex-post	Ex-ante
Eligibility and time commitment	• Private or nonfederal public lands in the continental US and Alaska. • Projects located on tribal lands must include a waiver of sovereign immunity for the project area. • The crediting period is a renewable 25-year term from the project's start date.	• Any degraded lands. • 40-year minimum time commitment.	• Any ownership and any location where reforestation is ecologically suitable. • No specified time commitment, but project is assumed to last until planted trees reach a point in time when they would likely be harvested. • Conservation easement can increase crediting period, up to 100 years. • Allows for option to transition to ex-post offset reforestation protocol.
Project ownership	• Forest owner: the entity must demonstrate interest/ownership of trees. • Consolidation of multiple land holdings with multiple fee owners into a single project is permitted. • Only one forest owner may be issued credits and be responsible for project management; all forest owners involved are liable for reversal risk. • Individual projects may not group together to form an aggregate.	• Project proponent: the entity that can demonstrate ownership or control of reforestation or afforestation activities. • Consolidation of multiple land holdings with multiple fee owners into a single project is permitted. • Individual projects may group together to form an aggregate. • Must follow ACR's aggregation or development aggregation guidance.	• Project proponent: entity with the legal control of trees on the property or that has demonstrated right to be issued credits for the project. • Consolidation of multiple land holdings with multiple fee owners into a single project is permitted. • A single project proponent must be identified and must demonstrate the right to be issued credits for all lands participating in the project. • Individual projects may not group together to form an aggregate.
Additionality	• Land that has had less than 10% canopy cover for 10 years automatically qualifies. • Land that has undergone a natural disturbance must not have historically engaged in harvesting or must be part of an eligible scenario (see protocol). • Project activity must not be mandated by law.	• Project activity must not be mandated by law. • Project activity must exceed common practice in the region as determined by a qualitative assessment. • Project must demonstrate an implementation barrier. • Project must use the "combined" Clean Development Mechanism (CDM) tool to determine baseline and additionality.	• Site must have been out of forest cover for at least 10 years or experienced a catastrophic natural disturbance within the past 10 years, with attestation from a professional forester or ecologist that trees would not establish on their own without intervention. • Amount of "additional" sequestered CO_2e recognized for crediting is based on pre-approved projections of increases in live tree carbon stocks, by forest type and landowner type, as well as whether projected increases in carbon stocks are secured in perpetuity (e.g., by a conservation easement).
Baseline	• Project baseline depends on the alternative land use. • Projects can use project-specific documents (such as construction plans) or default rates of conversion from the protocol.	• Changes in baseline tree carbon are calculated through protocol equations and modeling stocks using Forest Service's Forest Vegetation Simulator.	• Project baseline is assumed to be zero.

3-5. Table Afforestation/Reforestation Protocols Comparison (cont.)

	CARB: US Forest Compliance Protocol	ACR: Afforestation and Reforestation of Degraded Land	CAR Climate Forward: Reforestation Project Forecast Methodology
	Ex-post	Ex-post	Ex-ante
Natural forest management	• Requires Forest Stewardship Council, Sustainable Forestry Initiative or American Tree Farm System certification. • Projects must meet native species criteria within 25 years. • Restricts even-aged harvesting practices to 40 acres.	N/A	• Project must support and/or enhance native ecosystems with objective of initiating a forest of diverse native tree species. • Species mix must be approved by a professional forester or ecologist.
Project commitment	100+ years	40 years	• Up-to-date credit issued, typically 1 year after project implementation. • MRV required for projects seeking additional credits.
Permanence	100 years	Up to 40 years	• Credit issuance is based on a 100-year permanence standard. • If CO_2e sequestered can be secured in perpetuity via a conservation easement, projects are issued 1 credit per 1 metric ton of additional CO_2e. • If additional CO_2e sequestered cannot be secured in perpetuity, projects are issued 0.01 credit for each year that each 1 metric ton of "additional" CO_2e sequestered (1% per metric ton per year) is assumed to be maintained into the future. This assumption varies depending on forest type and forest owner type and may range from 25 to 100 years. • No MRV required post-crediting.
Optional project tools	N/A	N/A	• Reforestation Project Methodology Calculation Tool (performs credit calculations).

Afforestation/Reforestation

There are only a handful of US afforestation/reforestation projects registered in carbon programs, and only two projects have issued credits to date. The lack of projects is likely due to the large upfront capital needed for site preparation and planting trees. Under an ex-post offset credit program, carbon revenues are delayed until the trees grow large enough to make verification financially feasible. However, Climate Action Reserve's (CAR's) relatively new ex-ante option for reforestation projects helps make such projects financially feasible by reducing the mismatch between project investment and project crediting.

3-6. Table Grassland Protocols Comparison

	ACR: Avoided Conversion of Grasslands and Shrublands to Crop Production	CAR: Grassland Project Protocol
Location	• Grassland/shrubland located in the US.	• Grasslands in the continental US.
Project ownership	• Multiple parties may be involved but, at a minimum, there will be a project participant (e.g., the owner of the participating field). • A project proponent (e.g., an aggregator or project developer) may also participate in ownership. The greenhouse gas reductions must be clearly conveyed from the project participant to the project proponent.	• Multiple parties may be involved but, at a minimum, there must be a grassland owner who is the owner of the fee land within the project area. • An easement holder, project developer or cooperative developer (or any combination thereof) may also be involved. One of the parties involved must be identified as the project developer, who holds ownership of the emission reductions (conveyed through the easement or a separate legal agreement).
Aggregation	• Projects may participate in an aggregate, as defined in ACR's guidance.	• Projects may join a cooperative, as defined in the protocol and described in Table 4-1.
Additionality	• Project activities must not be required by law. • Enhancement payments may be permitted.	
	• Depending on project location, the project will refer to a list of eligible counties identified by the protocol. • If the project county is not listed, the project participant can refer to a specific offer to rent or purchase the field.	• Project area must legally be able to convert to cropland as of the start date. A performance standard test demonstrating financial pressure to convert to cropland is needed. • Land is suitable for growing crops.
Baseline	• Baseline must be calculated using DayCent or another peer-reviewed, empirical model demonstrating soil carbon loss due to conversion.	• Baseline emissions can be calculated automatically using GrassTool once project characteristics are identified.
Environmental safeguards	• Overgrazing, overstocking or overuse of prescribed fires is not allowed.	• Ecosystem health assessments, using NRCS/BLM protocol, must be conducted at least every 6 years. • If grazing takes place, there must be mechanisms to prevent overgrazing.
Project commitment	40 years	100+ years
Permanence	Up to 40 years or the end of the easement term.	100 years
Optional project tools	N/A	• GrassTool: used for calculating total project crediting potential. • Grassland Project Handbook.

GRASSLANDS

Grassland ecosystems have a strong presence in the offset market due to their carbon-rich soils and many co-benefits, which make them attractive to both offset project developers and offset buyers. While future opportunities may lie in grassland restoration or soil enhancement, current available offset protocols focus on the avoided conversion of grassland. Through transfer of ownership or a conservation easement, avoided grassland conversion offset projects protect existing carbon by removing the risk of conversion to cropland.

Avoided grassland conversion projects prevent emissions of greenhouse gases by conserving belowground carbon stocks and avoiding crop cultivation activities by placing perpetual conservation easements on an eligible project area to prevent tillage. The project area must be grassland that is suitable for conversion to crop cultivation. Protocols include a minimum amount of time that the land must have been under grassland cover to be eligible. This project type does not include restoration of native grasslands. The baseline scenario is conversion to crop cultivation. While the American Carbon Registry (ACR) and Climate Action Reserve (CAR) both offer protocols for this project type, currently, there are no California compliance protocols applicable to grassland projects. All protocols require that a conservation easement be recorded on the project site or that the land be transferred to public ownership.

WETLANDS

Carbon held in wetlands is often referred to as *blue carbon*, and it has been an area of interest in the carbon market for some time. However, development of protocols in this area has been slow due to high upfront costs of implementation and limited potential for scalability. Currently, the American Carbon Registry (ACR) has three methodologies applicable to regionally specific wetlands: Restoration of California Deltaic and Coastal Wetlands; Restoration of Degraded Wetlands of the Mississippi Delta; and Restoration of Pocosin Wetlands. To date, ACR has not issued any credits to these project types.

Solano Land Trust (CA), accredited. Photo courtesy of DJ Glisson II, Firefly Imageworks.

SOIL CARBON

Soil carbon is another area of great interest to carbon markets that has yet to see many projects. Soil carbon is considered a potential emission source in forest and grassland project carbon accounting (particularly for avoided conversion projects in which soil carbon is the largest source of baseline emissions avoided through the project activities). However, in the United States, there is no widely used set of practices to increase soil carbon sequestration. Climate Action Reserve (CAR) is in the process of developing an offset protocol that recognizes agricultural practices that enhance soil carbon storage. Examples of potential eligible practices include crop rotations, prescribed grazing and use of riparian buffers.

Similarly, biochar, an organic soil additive that can increase the amount of carbon sequestered in soil and simultaneously enhance drought resilience, has been another area of strong interest. As of mid-2020, no methodology for biochar projects exists in the main carbon registries in the United States, but there continues to be significant desire to develop a way to recognize the climate benefits of biochar.

CASE STUDY

Southern Plains Land Trust, Voluntary Avoided Grassland Conversion Project

The Southern Plains Land Trust (SPLT) is an accredited land trust in Lamar, Colorado, with a mission to create and protect a network of shortgrass prairie preserves. The land trust acquires land for habitat conservation and land stewardship and it has protected over 32,000 acres in its preserve network.

The land trust completed three carbon projects under a cooperative structure as part of a 2016 initiative funded by USDA's Conservation Innovation Grant (CIG). The grant sought to develop standardized tools for a pilot avoided grassland conversion project using Climate Action Reserve's (CAR's) Grassland Project Protocol. Upfront project development costs were covered under the grant, and, at the time, SPLT had also just granted a conservation easement on its Raven's Nest Nature Preserve and Heartland Ranch Nature Preserve, making those properties eligible for a carbon project. The SPLT board had previously assessed carbon market opportunities, so when it was approached by a project developer, the board was comfortable moving forward given the financial support from the CIG initiative. The Environmental Defense Fund (EDF) acted as project developer and trained SPLT executive director Nicole Rosmarino by providing guidance and support, which counted toward EDF's in-kind contribution against the grant award. EDF helped to register the project and develop long-term monitoring plans, with the land trust staff providing technical support on its project development tools.

The pilot served as proof of concept for the market viability of voluntary grassland carbon credits, and SPLT has since added another project, creating a cooperative of four projects with plans to add another in 2020. SPLT is now pursuing a credit sales structure that better aligns with the organization's long-term financial goals and allows the land trust to include carbon projects in its acquisition strategy. For example, SPLT works with buyers who pay upfront for credits to be delivered later (i.e., after the project's next verification) or who commit to buying a quantity of future credits at a set price. This approach allows SPLT to use those funds to acquire more grassland, which, in turn, sequesters more carbon.

Easement Considerations

Perpetual conservation easement included language that:

1. Permanently prevented the conversion of the project area to other land uses
2. Stated that the easement was granted pursuant to the state enabling statute for conservation easements. The cooperative is comprised of four projects that were developed in phases coinciding with the timing of acquisition deals.

Heartland Ranch Nature Preserve. Photo courtesy of Southern Plains Land Trust.

3-7. Table Southern Plains Land Trust, Voluntary Avoided Grassland Conversion Project

Project structure	• SPLT is the cooperative developer and project owner, project developer and landowner for all four projects within its cooperative. • Colorado Open Lands is the easement holder for all four projects.
Roles and service providers	• Environmental Defense Fund provided initial technical assistance.
Project specifications	• Registered with CAR. • 11,927 acres on SPLT fee-owned land. • Primarily shortgrass prairie habitats with seasonal creeks and gullies, home to pronghorn, mule deer, elk, tiger salamanders, raptors and many more native animals and plants.
Credits issued	• 28,390 credits issued to date. • 10,790 estimated annual credits issued.
Resources and costs	• CIG funding covered the project development costs for Raven's Nest and Heartland Ranch Phases I and II, including legal fees for credit sales contracts. These contracts now serve as templates for future sales. • Transaction costs for land acquisition that includes due diligence for conservation easement assessment and analysis for carbon project requirements total about $50,000–$70,000. • Initial carbon project verification costs about $10,000/project. • Subsequent carbon project verification costs about $5,000/project. • Cooperative projects may be able to negotiate discounts from verification bodies of about 10%. • Cooperative project structure provides ongoing management efficiencies for project monitoring and reporting. • Project requires about 10–20 hours of executive director's time each month.

Credit sales structure	• Primarily transacting in volumes over 1,000 per sale.
	• Microsoft purchased a portion of the initial credits for the pilot project.
	• Sells for $20/credit for volumes under 1,000; $10/credit for volumes over 1,000.
	• Anticipates a multi-year verification schedule and exploring forward credit sales opportunities.
	• Worked with five different buyers spanning a range of sales models, including:
	  ◦ Buyer reserves future orders as part of initial transactions
	  ◦ Buyer makes one-time purchase of existing supply
	  ◦ Buyer pays upfront premium to secure fixed price for credits to be delivered in the future, with additional payment made upon credit delivery
	• Secured about $165,000 in net revenue from completed sales to date, not including completed forward sales contracts.
	• Anticipates about $100,000/year in carbon credit revenue, comprising about a third of SPLT's annual expenses.

Project benefits	• Provides financial security for the organization. • Revenue is reinvested into stewardship for the prairie. • There are cost and administrative efficiencies associated with land acquisition due diligence and carbon project feasibility assessment and planning. • Grassland carbon projects are highly compatible with long-term ecosystem health and protection, aligning the market with the land trust's goals for stewardship.
Lessons learned	• Highlighting additional ecosystem benefits of carbon projects, such as habitat and species protection, education and water quality improvements, can help secure higher credit prices in the voluntary market. • Consider cooperative approach to projects to secure cost and management efficiencies. • Maintain an entrepreneurial mindset when considering credit sales.

04

AGGREGATION AND COOPERATIVE APPROACHES

When developing carbon projects, the cost-benefit analysis is a crucial decision point. All carbon programs and project types have certain costs that are inevitable. Verification and inventory cost, for instance, are fairly stable, regardless of project size. On the other hand, credit issuance is largely driven by the number of acres enrolled in a project. This fact serves to drive up the minimum acreage needed to make an individual project cost effective.

Project developers have two pathways to achieve economies of scale so landowners with smaller land holdings can also benefit from the carbon market. The first option involves consolidating land holdings by working with multiple landowners to develop a single project. While this may be feasible under the California Air Resources Board (CARB) and American Carbon Registry's (ACR's) programs, it is subject to eligibility requirements and demonstration of carbon ownership. The second option involves the ability to manage multiple discreet projects together through a registry's aggregation and/or cooperative guidance. This second approach allows individual projects to form an **aggregate** or a **cooperative**, and both ACR and Climate Action Reserve (CAR) offer guidance that lets such grouped projects coordinate monitoring, reporting and verification activities, thereby reducing the cost of project management. Aggregates and/or cooperatives must designate a single entity as responsible for managing projects within the unit, as described in Table 4-1. Projects must still be individually eligible, and different aggregation methodologies may have different administrative requirements, as described in Table 4-1.

CARB does not currently provide an option for aggregation of multiple discreet projects under the compliance program. However, CARB does allow a single forest project to be undertaken with multiple forest owners, so long as the project meets all eligibility requirements. This is sometimes referred to by market participants as *aggregation* (although CARB does not refer to it as such). It does allow for smaller landowners to join together on a project, but the legal implications must be carefully considered. If a reversal takes place on one landowner's property, the other owners would be held just as liable as the entity that caused the reversal.

FOREST PROJECTS INVOLVING MULTIPLE LANDOWNERS

Land trusts can also serve as an aggregator or cooperative developer of carbon projects that involve multiple land holdings or owners, benefiting private landowners and helping to achieve conservation at scale. While there are challenges to this approach, it can also unlock critical benefits. These include crediting at volumes needed to achieve economies of scale, as well as immense marketing and credit sales benefits. Marketing benefits include the ability to "brand" credits based on a region or watershed, for example, or the ability to reach buyers through land trust relationships.

There are several existing programs and programs under development that offer a range of cost-share models and standalone services for project development. For

Aggregation: A means for managing multiple discrete projects as a single unit under a carbon-crediting program's guidance for aggregation, with the intent of reducing management costs.

Cooperative: A means for managing multiple discrete projects as a single unit, as applied to Climate Action Reserve's Grassland Protocol.

4-1. Table Aggregation and Cooperative Approaches

	ACR Aggregation	ACR Project Development Aggregation	CAR Aggregation	CAR Cooperatives
Applicable project types	• Agriculture, forest and other land uses.		• Forest	• Grassland
Project limitations	• Projects can span no more than three ecoregions • Projects must use same methodology or pair of methodologies.		• Only projects <10,000 acres • Different forest project types may aggregate together (e.g., an IFM project and avoided conversion project may be in the same aggregate).	• Projects within the same protocol may enter into a cooperative.
Aggregator/ Cooperative developer	• A single entity must be identified as the aggregator or cooperative developer. • Must be an entity qualified to act as a project developer, as described in the protocol comparison Tables 3-1, 3-5 and 3-6.			
Timing considerations	• Projects must have the same start date. • All projects must enroll at one time.	• Projects must have an implementation date on or after the overarching start date of the aggregate. • A project can enroll within five years of its implementation date.	• Projects can enter or exit at any time.	
Monitoring/ reporting	• Inventory precision (+/- 10% at the 90% confidence level) is pursued at the aggregate level. • Summary reports may be submitted.		• Reduced number of inventory sampling plots required for individual projects. • Projects must align their reporting periods. • Summary reports may be submitted.	• Projects must align their reporting periods. • Projects report data individually.
Verification schedule	• All projects must undergo initial validation together.	• Projects enrolling together are considered a cohort and must maintain the same verification schedule. • Verifiers may use a risk assessment to determine which sites require a site visit. • All sites require a desk review, at a minimum.	• Projects must align their verification schedules. • Reduced site visit frequency compared to individual project verification. • Verifiers may submit a single report.	• Projects must align their verification schedules. • Verifiers may submit a single report.
Project independence	• If a crediting period is renewed, all sites must be re-validated.	• If a crediting period is renewed, all sites must be re-validated. • Records and documentation are maintained for each site.	• Projects maintain their own credits and crediting periods. • Projects are responsible for avoidable reversals that take place within their boundaries.	• Projects maintain their own data, credits and crediting periods.

example, The Nature Conservancy (TNC) offers a cost-share model through its Working Woodlands Program. The program leverages the market demand for certified forest products and carbon offsets to help landowners achieve management goals. Landowners with more than 2,000 acres are eligible to participate and receive a customized 10-year management plan that incorporates conservation easements, Forest Stewardship Council certification and access to carbon markets for those interested.

EMERGING OFFSET PROGRAMS

Family Forest Carbon Program

The Family Forest Carbon Program is a new program, created by the American Forest Foundation (AFF) and The Nature Conservancy (TNC), which brings together rural family forest owners and companies to address climate change together.

In the United States, families and individuals own the largest portion—36 percent—of all forests. Yet many of these owners have been unable to access carbon markets due to high upfront costs and complexity. The Family Forest Carbon Program aims to help solve this challenge, giving family forest owners an opportunity to bring in income from their land, in exchange for implementing sustainable forest practices that help sequester and store more carbon. Companies in turn can purchase this carbon in the form of verified carbon credits. AFF and TNC are currently piloting this program in Pennsylvania. Specifically, landowners can participate in two practices:

- Growing Mature Forests. The Growing Mature Forests practice promotes the growth of larger, higher quality trees by limiting harvesting over a 20-year contract period, in line with the landowner's management plan.
- Enhancing Future Forests. The Enhancing Future Forests practice promotes robust, successful regeneration of new forests by having the landowner reduce competing vegetation following or preceding a regeneration harvest. This practice will allow quality trees to have the space, sunlight and water needed to grow.

During the pilot phase, AFF and TNC will continue working with Verra on the methodology approval process, with the goal of achieving final Verified Carbon Standard (VCS) inclusion in late 2020.

CORE Carbon

CORE Carbon is another new program created by Finite Carbon. The program aims to help land trusts and landowners of smaller forest holdings (40 to 5,000 acres) access the carbon offset market. With a planned launch in late 2020, CORE Carbon is a web-based platform that will allow small forest landowners to generate new annual revenue through long-term commitments to good stewardship. Land trusts can use CORE Carbon free of charge and, once enrolled, they are guaranteed multiyear payments for the resulting carbon offsets from buyers seeking to offset their greenhouse gas emissions. Finite Carbon is co-authoring a new methodology with the American Carbon Registry (ACR), which will guide this program and provide uniform carbon offset standards designed specifically with small landowners in mind.

LAND TRUST ALLIANCE FIVE-YEAR PILOT PROGRAM FOR LAND TRUSTS TO ACCESS CARBON MARKETS

In 2020, the Land Trust Alliance and its partners launched a five-year pilot program to provide access to carbon markets and a new source of conservation funding for land trusts who otherwise would not be able to participate. The pilot program consists of two parts:

- The first, with Finite Carbon, assists land trusts with forested fee-land ownerships that are too small to qualify for carbon projects on their own to gain access to the voluntary carbon offset market through the American Carbon Registry's Improved Forest Management Protocol by aggregating their holdings with those of other land trusts.
- The second, with The Climate Trust, will facilitate the protection of grasslands by providing upfront cash payments to land trusts, based on anticipated future carbon revenues, to help finance the purchase of no-till grassland conservation easements to make those lands eligible for the voluntary carbon offset market through the Climate Action Reserve's Grassland Protocol.

Prospective land trusts must be accredited or committed to becoming accredited as indicated through a board resolution. For grassland easement projects, land trusts must commit to operate, monitor and steward the project for over 100 years and, for forest fee-land projects, they must commit to operate, monitor and steward the project for over 40 years.

The Land Trust Alliance will facilitate the participation of land trusts, coordinate the various stages of the project and provide grants to help select land trusts cover their staff and out-of-pocket expenses. The Climate Trust and Finite Carbon will serve as technical project developers for grassland and forest projects respectively, including assessing project feasibility, negotiating commercial terms and marketing and selling offset credits to buyers. For more information, go to www.landtrustalliance.org/topics/climate-change/carbon-offset-pilot-program.

CASE STUDY

New England Land Trust Projects

Both the accredited Lakes Region Conservation Trust (LRCT) in New Hampshire and the accredited Vermont Land Trust (VLT) are also currently developing projects that consolidate lands of multiple landowners to develop a single project.

LRCT developed a compliance improved forest management project that involves parcels the land trust owns in fee and parcels owned by a private landowner on which LRCT holds a conservation easement. LRCT is the offset project operator dealing directly with the California Air Resources Board (CARB). The credit revenue benefit and project administration logistics are negotiated through private operating agreements between the land trust and the private landowner. This project is registered with the American Carbon Registry (ACR), and project development services are provided by Finite Carbon. LRCT is the only entity under contract with Finite Carbon.

In 2020, VLT launched a first-of-its-kind carbon mitigation program in partnership with Cold Hollow to Canada, a grassroots organization that supports the protection of the Northern Forest in Vermont. Through the voluntary carbon market, 10 forestland owners across 7,500 acres will receive payments for managing their forests to maximize carbon storage and sequestration. The project was developed in partnership with The Nature Conservancy, which has helped to secure buyers, including Amazon, for the credits.

VLT's project is being developed under ACR's program, and the project's approach to aggregation is also outside of the registry framework. This approach means that all participating landowners have transferred control of forest carbon to VLT, and they have allowed VLT to develop a single project on lands owned in fee by multiple landowners. To do so, VLT set up a separate limited liability corporation that acts as the project proponent. The services provided by VLT through this separate entity include upfront financing, project development, consultant management, credit marketing and sales. Credit buyers will deal directly with this single entity, and revenue from credits are allocated to participating landowners based on contracts between the landowners and the LLC.

The project will provide water quality improvements in the watershed, with benefits that include flood-control management and endangered species protection, as well as recreational access and education for local communities. Other partners include the Vermont Housing & Conservation Board, the University of Vermont, the Land Trust Alliance, the Cotyledon Fund and the High Meadows Fund.

Photo courtesy of the Vermont Land Trust.

VLT's foray into carbon markets was driven by the land trust's mission to support landowners in its region to protect and steward their lands. At the outset of the project, the land trust conducted an in-depth assessment, in partnership with Spatial Informatics Group and the University of Vermont, to identify landowners eligible to access carbon finance for conservation. From there, VLT leveraged its relationships with landowners through existing programs, such as its Regional Conservation Partnership, to begin outreach, education and scoping. The process took almost two years and informed the design of a program that landowners can easily sign on to, without having to take on the burden of project development, administering ongoing monitoring, reporting and verification and dealing directly with multiple actors involved in the market.

In addition to the carbon credit sales from the Cold Hollow project, VLT is also advancing additional aggregated forest carbon projects in other parts of Vermont.

Openlands (IL). Photo courtesy of DJ Glisson II, Firefly Imageworks.

05

CONCLUSION

Carbon projects can be complicated, and carbon markets are dynamic, but they also represent an extremely useful tool in the conservation toolbox. Carbon can finance more land conservation and land trust operations as well as increase stewardship, while at the same time allowing the land trust to take intentional climate action. Land trusts are in a unique and advantageous position to supply carbon credits for the voluntary market because of their skills, expertise and reputations. Land trusts are typically experienced with complex negotiations and long-term contracts. They also have the knowledge and relationships needed to acquire and organize private lands into viable carbon projects and they have the expertise to manage land for wide-ranging goals. In addition, working with a land trust gives a buyer the "feel good" element. The land trust's conservation mission and commitment to species protection and land stewardship provide added value to any transaction. Buyers appreciate being able to align their brand with these positive outcomes. When selecting projects and pricing credits, many buyers also genuinely prioritize what land trusts do: biodiversity and habitat protection, watershed resiliency and water quality improvements. For all these reasons and more, land trusts that can participate in carbon markets should seriously consider utilizing carbon finance opportunities to advance their conservation goals.

GLOSSARY

Additionality: A criterion for project eligibility defined by registries, which varies by carbon-crediting programs, to ensure the project activity is additional to what would have occurred in a baseline or business-as-usual scenario and that the project activity would not have occurred without the financial incentive of carbon benefits.

Aggregation: A means for managing multiple discrete projects as a single unit under a carbon-crediting program's guidance for aggregation, with the intent of reducing management costs.

Allowance: A government-issued permit, equivalent to one metric ton of carbon dioxide, used in cap-and-trade programs where businesses must calculate and submit allowances equal in volume to their annual emissions. In a cap-and-trade program, the total number of allowances issued will decline over time. Allowances can also serve as a price signal to the market.

Broker: An entity that works as an intermediary and does not take ownership of credits but facilitates transactions (for a fee) between landowners or project developers and end users or retailers. Some retailers will also perform this role, but generally not at significant volumes.

Buffer pool: A holding account for carbon credits from sequestration projects, administered by individual registries. It is used as a general insurance mechanism against unavoidable reversals for all sequestration projects within a carbon program. For example, if a forest project experiences an unavoidable reversal of greenhouse gas reductions and removals (such as trees lost due to a forest fire), the registry will retire credits from the buffer pool equal to the total amount of carbon that was reversed (measured in metric tons of carbon dioxide).

Business as usual: The activities and associated greenhouse reductions and removals that would have occurred in the project area in the absence of incentives provided by a carbon market. Methodologies for determining these activities—and for approximating carbon stock levels that would have resulted from these activities—vary by registry program and project type.

California's Compliance Offset Program: Carbon offset program administered by the California Air Resources Board (CARB), adhering to regulations set forth in Senate Bill 32 and Assembly Bill 398 in support of the state's cap-and-trade program.

Carbon project: An action or set of actions undertaken to lower atmospheric concentrations of greenhouse gases, typically CO_2. Carbon projects can generate financial benefits that flow from the production of climate benefits. These financial benefits are derived from participation in a carbon market.

Carbon project registry: An organization that establishes standards for quantifying and verifying greenhouse gas emission reduction projects, issues carbon credits and tracks the transfer and retirement of those credits in a publicly accessible online system.

Carbon stocks: The amount of carbon stored on a per unit area (i.e., acre) basis.

Cooperative: A means for managing multiple discrete projects as a single unit, as applied to Climate Action Reserve's Grassland Protocol.

Credit issuance: Projects are issued carbon credits upon demonstration of carbon reductions or removals at required intervals via ongoing project monitoring, reporting and verification (MRV) by third-party verification bodies.

Crediting period: The period over which a project's greenhouse gas reductions are eligible to be verified or confirmed and issued carbon credits. Crediting periods are limited to ensure that a project's baseline remains credible.

Desk verification: A review of project documentation, project inventory reports and the methods used to calculate the number of carbon credits to be issued.

End buyer: A buyer who purchases carbon credits and retires them to balance against their own greenhouse gas emissions.

Ex-ante carbon credits: Carbon credits issued upon the implementation of project activities that will produce greenhouse gas emissions reductions in the future. Ex-ante credits represent *projected* emissions reductions and are used to balance against *anticipated future* emissions.

Ex-post carbon credits: Carbon credits representing greenhouse reductions that have already occurred elsewhere. Such credits are commonly called offsets. See also *offset*.

Greenhouse gas: Gas that contributes to global warming and climate change. For the purposes of this publication, greenhouse gases are the six gases identified in the Kyoto Protocol: carbon dioxide; nitrous oxide; methane; hydrofluorocarbons; perfluorocarbons; and sulfur hexafluoride.

Greenhouse gas sink: Any reservoir, natural or otherwise, that absorbs more carbon than it releases and thereby lowers the concentration of greenhouse gases in the atmosphere.

Listed: The status of a project once the project owner has created an account with a carbon registry and submitted the required forms and documents and the registry has approved and accepted the project for listing.

Metric ton or tonne: A common international measurement for the quantity of greenhouse gas emissions, equivalent to about 2,204.6 pounds or 1.1 tons.

Offset: A reduction or removal of greenhouse emissions from the atmosphere that is used to compensate for an equivalent amount of emissions from another greenhouse gas-emitting activity occurring elsewhere. The terms *offset* and *ex-post carbon credit* are often used interchangeably.

Offset Project Registry (OPR): A registry approved by the California Air Resources Board (CARB) to help administer parts of the Compliance Offset Program. Offset Project Registries help facilitate the listing, reporting and verification of offset projects developed using the Compliance Offset Protocols. They also issue registry offset credits, which cannot be used for compliance with the cap-and-trade program unless they are converted to ARB offset credits. ACR, CAR and Verra are carbon project registries approved to serve as Offset Project Registries for California's Compliance Offset Program.

Onsite verification: A site visit to the project area, in addition to the desk verification.

Permanence: The requirement that greenhouse gases must be permanently reduced or removed from the atmosphere for projects to be issued carbon credits. For sequestration projects, this requirement is met by ensuring that the carbon associated with credited greenhouse gas reductions and removals remains stored for at least a minimum number of years defined by the applicable registry.

Project developer: An organization or individual that registers projects for the purpose of generating emission reductions or removals. The project developer may be the same entity as the project owner or may act as a technical consultant on behalf of the project owner.

Project owner: The entity responsible for undertaking a project and registering it with a carbon program. This entity is responsible for executing agreements with the registry and for the ongoing management requirements of the project. Different carbon programs use different terms to describe the entity ultimately responsible for the carbon project. See Tables 3-1, 3-5 and 3-6 for information regarding which entities may assume the role of project owner. The project owner may be the same entity as the project developer. Equivalent terms for each carbon program:

- CARB and CAR's improved forest management protocol (forestry): offset project operator
- ACR and CAR's Climate Forward Program: project proponent
- CAR's AGC protocol (grassland): project developer

Protocol: A document that contains the eligibility rules, greenhouse gas assessment boundary, quantification methodologies, monitoring and reporting parameters and so forth for a specific project type. Project protocols are also referred to as *methodologies*, with the terms used interchangeably depending on the registry.

Qualified conservation easement: Carbon programs may use the term *qualified* to describe a conservation easement that includes the terms and conditions specified by the applicable carbon program or protocol to address management requirements that affect carbon stocks within the project area. The easement will apply to current and all subsequent project owners for the full duration of the project's minimum time commitment. In this context, it does not refer to the IRS definition of *qualified conservation easements*.

Reduction: The avoidance or prevention of an emission of greenhouse gases. Reductions are calculated as gains in carbon stocks over time relative to a project's baseline.

Registered: The status of a project when it has been verified by an applicable registry-approved and ISO-accredited verification body, all required documentation has been submitted by the project owner for final registry approval, and the registry has approved the project. A project is registered once, at the same time as the initial credit issuance to the project.

Removal: Sequestration or removal of carbon dioxide from the atmosphere caused by a project. Removals are calculated as gains in carbon stocks over time relative to a project's baseline.

Reporting period: A discrete period over which a project's greenhouse gas reductions are quantified and reported to a registry.

Retailer: An entity that contracts with a landowner or project developers to take ownership of a portfolio of carbon credits that it then offers to end buyers. Retailers typically offer other corporate sustainability services. Many retailers also offer project development and management services.

Retired: The status of carbon credits when they are transferred to a retirement account in a registry system and removed from circulation. Retirement accounts are permanent and locked so that a retired credit cannot be transferred again. Credits are retired when they have been used to offset an equivalent metric ton of emissions or have been removed from further transactions on behalf of the environment.

Reversal: A decrease in the stored carbon stocks associated with quantified greenhouse gas reductions and removals that occurs before the end of the project life. In general, a reversal is deemed to have occurred if there is a decrease in the difference between project and baseline onsite carbon stocks from one year to the next, regardless of the cause of this decrease.

Serialized credits: Carbon registries issue unique serial number identifiers to each carbon credit they register to ensure that each metric ton of emission reductions is counted and retired only once.

Verification: The process of reviewing and assessing all of a project's reported data and information by an accredited verification body, to confirm that the project owner has adhered to the requirements of this protocol. Verification can take two forms: see *desk verification* and *onsite verification*.

Verification body: An organization or company that has been ISO-accredited and approved by the applicable registry or CARB to perform greenhouse gas verification activities for specific project protocols.

Verification period: The period over which greenhouse gas reductions or removals are verified. A verification period may cover multiple reporting periods. The end date of any verification period must correspond to the end date of a reporting period.

Vintage: The year in which emissions reductions occur. The vintage of the credits may not necessarily be the same as the year the credits are issued or the year in which the credits are sold. Prices on the voluntary market often vary depending on the vintage.

ADDITIONAL RESOURCES

Carbon Market—Compliance

Dylan Jenkins, *FCWG 2018–19 Learning Exchange Series Session: Finite Carbon / Forest Carbon Offsets: A Viable Opportunity for US Landowners?* Michigan State University, Department of Forestry, Forest Carbon and Climate Program, January 9, 2019, https://www.canr.msu.edu/news/fcwg-2018-19-learning-exchange-series-session-finite-carbon.

Erin Clover Kelly and Marissa Bongiovanni Schmitz, "Forest Offsets and the California Compliance Market: Bringing an Abstract Ecosystem Good to Market." *Geoforum*, Volume 75, October 2016, pp. 99–109.

Carbon Market—General

Derik Broekhoff, Patrick Cage, Michael Gillenwater and Tani Colbert-Sangree, *Securing Climate Benefit: A Guide to Using Carbon Offsets.* GHG Management Institute and Stockholm Environment Institute, 2019.

Stephen Donofrio and Kelley Hamrick, *FCWG 2018–19 Learning Exchange Series Session: Forest Carbon Markets—Overview and Potential.* Michigan State University, Department of Forestry, Forest Carbon and Climate Program, April 3, 2019, https://www.canr.msu.edu/news/fcwg-2018-19-learning-exchange-series-session-forest-carbon-markets-overview-and-potential.

Sean Donovan, Erica Morehouse, Katie Sullivan and Katelyn Roedner Sutter, *California: An Emissions Trading Case Study.* Sacramento, CA and Toronto, ON: Environmental Defense Fund and IETA, January 2018.

Carbon Market—Voluntary

Christine Cadigan, Rita Hite and Josh Parrish, *FCWG 2018–19 Learning Exchange Series Session: The Family Forest Carbon Initiative.* Michigan State University, Department of Forestry, Forest Carbon and Climate Program, May 8, 2019, https://www.canr.msu.edu/news/fcwg-2018-19-learning-exchange-series-session-the-family-forest-carbon-initiative.

Mackenzie Fuqua, William S. Keeton, Charles Kerchner and William VanDoren, *Vermont Forest Carbon: A Market Opportunity for Forestland Owners.* Carbon Dynamics Lab, University of Vermont, Spatial Informatics Group and Vermont Land Trust, March 2018.

Land Trust Stories

Downeast Lakes Land Trust, "The Finite Carbon-Lyme Grand Lake Stream Improved Forest Management Project," October 12, 2016, https://downeastlakes.org/the-finite-carbon-lyme-grand-lake-stream-improved-forest-management-project/.

Lakes Region Conservation Trust, "LRCT's Carbon Offset Project," accessed September 19, 2020, https://lrct.org/about-lrct/lrcts-carbon-offset-project/.

Darci Palmquist, "Keeper of the Trees." *Saving Land*, Vol. 37, no. 3 (Summer 2018), pp. 28–29.

Marina Schauffler, "Looking to the Land to Mitigate Climate Change." *Saving Land*, Vol. 37, no. 2 (Spring 2018), pp. 22–25.

Protocol—Forest

Climate Action Reserve, *Key Accounting Principles for Improved Forest Management Projects with the Forest Protocol.* 2019.

___, "Long Term Management of Forest Carbon Projects," 2019. (Video recording of webinar, 2 hrs in length.)

Sarah Wescott, *FCWG 2018–19 Learning Exchange Series Session: Climate Action Reserve / Carbon Market Opportunities and Project Development Tools for Forest Owners.* Michigan State University, Department of Forestry, Forest Carbon and Climate Program, July 10, 2019, https://www.canr.msu.edu/news/fcwg-2018-19-learning-exchange-series-session-climate-action-reserve.

Protocol—General

Joe Fargione, *FCWG 2019–20 Learning Exchange Series Session: Opportunity Assessments for Natural Climate Solutions.* Michigan State University, Department of Forestry, Forest Carbon and Climate Program (FCCP), January 8, 2020, https://www.canr.msu.edu/news/fcwg-2019-20-learning-exchange-series-session-opportunity-assessments-for-natural-climate-solutions and a last accessed not for October 9, 2020.

Protocol—Grassland

Climate Action Reserve, "Grassland Protocol," accessed September 19, 2020, https://www.climateactionreserve.org/how/protocols/grassland/.

Service Providers

Climate Action Reserve, "Offsets Marketplace," accessed September 19, 2020, http://www.climateactionreserve.org/how/offsets-marketplace/.

International Emissions Trading Association, "Our Members," accessed September 19, 2020, https://www.ieta.org/Our-Members.

Kelley Hamrick and Melissa Gallant, *Unlocking Potential: State of the Voluntary Carbon Markets 2017.* Washington, DC: Ecosystem Marketplace, 2017. See Appendix 4.

NOTES

Chapter One

1 Joseph E. Fargione, Steven Bassett, Timothy Boucher, Scott D. Bridgham, Richard T. Conant, Susan C. Cook-Patton, Peter W. Ellis, Alessandra Falcucci, James W. Fourqurean, Trisha Gopalakrishna, Huan Gu, Benjamin Henderson, Matthew D. Hurteau, Kevin D. Kroeger, Timm Kroeger, Tyler J. Lark, Sara M. Leavitt, Guy Lomax, Robert I. McDonald, J. Patrick Megonigal, Daniela A. Miteva, Curtis J. Richardson, Jonathan Sanderman, David Shoch, Seth A. Spawn, Joseph W. Veldman, Christopher A. Williams, Peter B. Woodbury, Chris Zganjar, Marci Baranski, Patricia Elias, Richard A. Houghton, Emily Landis, Emily McGlynn, William H. Schlesinger, Juha V. Siikamaki, Ariana E. Sutton-Grier, Bronson W. Griscom, "Natural Climate Solutions for the United States," *Science Advances* 4, no. 11 (2018): https://advances.sciencemag.org/content/4/11/eaat1869.

2 Maria Janowiak, William J. Connelly, Karen Dante-Wood, Grant M. Domke, Christian Giardina, Zachary Kayler, Kailey Marcinkowski, Todd Ontl, Carlos Rodriguez-Franco, Chris Swanston, Chris W. Woodall, Marilyn Buford, *Considering Forest and Grassland Carbon in Land Management*. Washington, DC, 2017: http://forestclimateworkinggroup.org/wp-content/uploads/2018/09/NIACS_Janowiak-etal-2017-Forest-and-Grassland-Carbon-Mgmt-1.pdf.

3 Lekha Knuffman, ed., *America's Grasslands Conference United for Grassland Conservation Proceedings of the Fourth Biennial Conference on the Conservation of America's Grasslands*. Washington, DC: National Wildlife Federation, 2017: https://www.nwf.org/-/media/Documents/PDFs/Our-Lands/2017_Grasslands-Conference-Proceedings.ashx?la=en&hash=4CD1DCBEC12F9275A7F7BC751D722E0EF63D745F.

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