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RANGELAND CARBON MARKETS REPORT IN BRIEF

A PRIMER ON THE HISTORY, FUNCTION AND PROCESSES OF CARBON MARKETS RELEVANT TO TEXAS RANGELANDS

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START HERE

Voluntary carbon markets have grown rapidly and continue to evolve in response to supply and demand, as well as controversies around credit quality and whether offset credits are yielding their stated benefits for climate mitigation. Given this transforming and sometimes volatile space, the future of the voluntary carbon market is hard to predict. Whatever happens, these markets are engaging landowners and affecting changes on Texas lands. Informed and cautious natural resources professionals and landowners will better prepare us for these changes and for other nascent markets for water, biodiversity and other ecosystem services. Since this is such a complex topic, we encourage readers to also use our full report on the history and processes of voluntary carbon markets to help navigate information around voluntary carbon markets by visiting: bit.ly/RangelandCarbonMarkets

ABOUT ECOSYSTEM SERVICES

Ecosystems are dynamic and complex systems made up of living organisms including plants, animals and microbes which interact with, transform, and depend upon non-living abiotic components such as local climate or geology. *Ecosystem services are the benefits people obtain from these ecosystems* and are generally described as falling into four categories:

1. **Provisioning services** are directly received benefits such as food, water, timber, or fiber.
2. **Regulating services** are those that moderate natural phenomena and include climate regulation, flood control, or water quality protection.
3. **Cultural services** provide recreational or aesthetic benefits.
4. **Supporting services** are those that support or facilitate many of the other service benefits. For example, soil formation, photosynthesis, and nutrient recycling.

PAYMENT FOR ECOSYSTEM SERVICES

An increasing number of Payment for Ecosystem Services (PES) schemes have been developed in the last decade to facilitate governmental, Non-Governmental Organizations (NGOs), and private organizations to pay for or receive payment for these public goods. The largest collection of PES markets is for ecosystem services related to climate change mitigation and the removal of atmospheric carbon dioxide through natural carbon sequestration and the reduction of carbon emissions from land use conversion or land management practices (i.e., voluntary carbon markets). Bottom line: While these carbon markets all differ in their application, most attempt to incentivize the landowner or land manager to enhance or conserve the ecosystem services provided by their lands.

WHAT IS CARBON SEQUESTRATION?

Primarily due to fossil fuel combustion, human-driven emissions have increased CO_2 levels in the atmosphere by 45% since the Industrial Age. Terrestrial ecosystems sequester and store an enormous amount of atmospheric carbon globally and land management, conservation, and steward-ship practices that enhance or protect that ecosystem service are increasingly seen as an area of importance for addressing climate change.

Carbon sequestration is the rate at which carbon is captured, converted, assimilated, and stored in an ecosystem. Through photosynthesis, plants convert carbon in the atmosphere, mostly CO_2, into compounds that are used as energy or to create plant tissues. A living plant's mass is made up mostly of water, but most of the dry mass of a plant is carbon sourced from the atmosphere.

WHAT IS CARBON STORAGE?

Carbon storage is the amount of carbon already in the system and is generally described as residing in carbon "pools" including aboveground biomass (e.g. tree trunks, stems and leaves), belowground biomass (e.g. root systems), and soil organic matter (e.g. plant litter that gets incorporated into the soil). The soil carbon pool is generally the largest and mostly closely tracked carbon pool within grass and shrubland systems.

The type of ecosystem, soils, climate, as well as the land management and stewardship practices on a plot of land affect soil carbon sequestration, carbon distribution and storage over time.

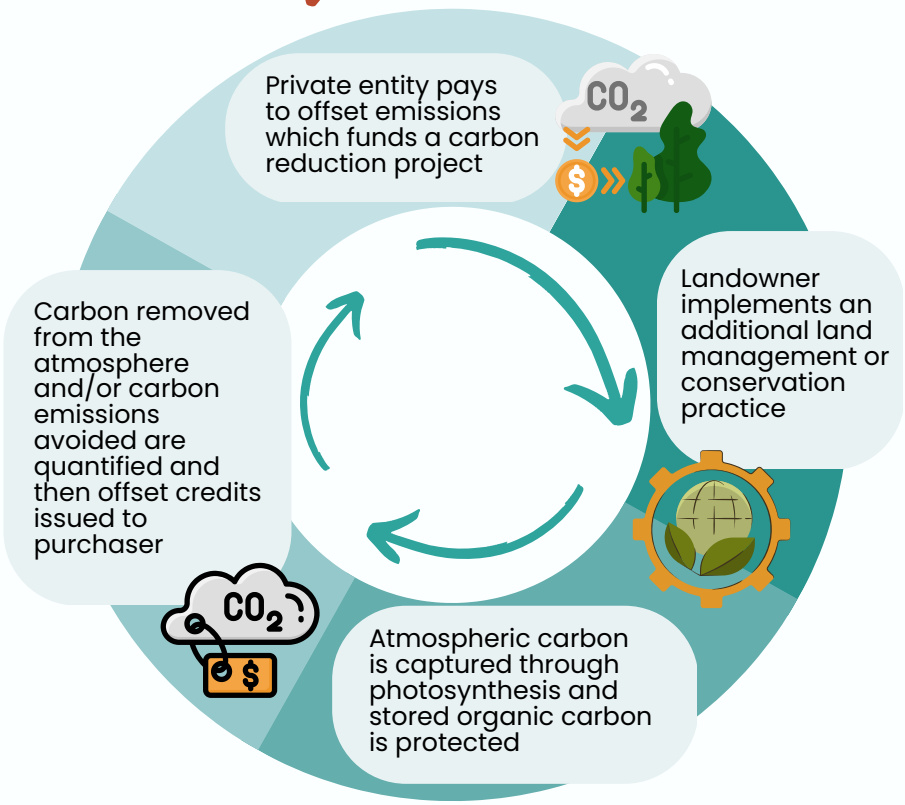
NATURE-BASED CARBON OFFSETS

Nature-based offset projects attempt to reduce atmospheric carbon by funding changes in agriculture, forestry or land use that result in:

1. avoided or reduced carbon emissions,
2. increased carbon sequestration,
3. or more carbon storage protection than would have occurred without project funding.

The reduced emissions and/or the amount of carbon removed or protected is quantified, credited, purchased, and the offset claimed by a purchaser to offset their own emissions inventory.

The nature-based voluntary carbon credit approach to offsetting emissions.



HOW THE VOLUNTARY CARBON MARKET PROCESS WORKS

Nature-based offset credits are generated and sold in highly fragmented markets—which are better described as a set of co-existing and competing private programs, rather than a cohesive singular market. While no two markets function in exactly the same way, the following is a good overview of the entities, their roles, and the process by which a credit is generated and sold. While this process does not have a single starting point, we will begin with protocol development under a registry (also called *standards*).

Although there are many registries/standards, the four largest entities that dominate the voluntary carbon market are 1) Verra, 2) Gold Standard, 3) Climate Action Reserve, and 4) the American Carbon Registry.

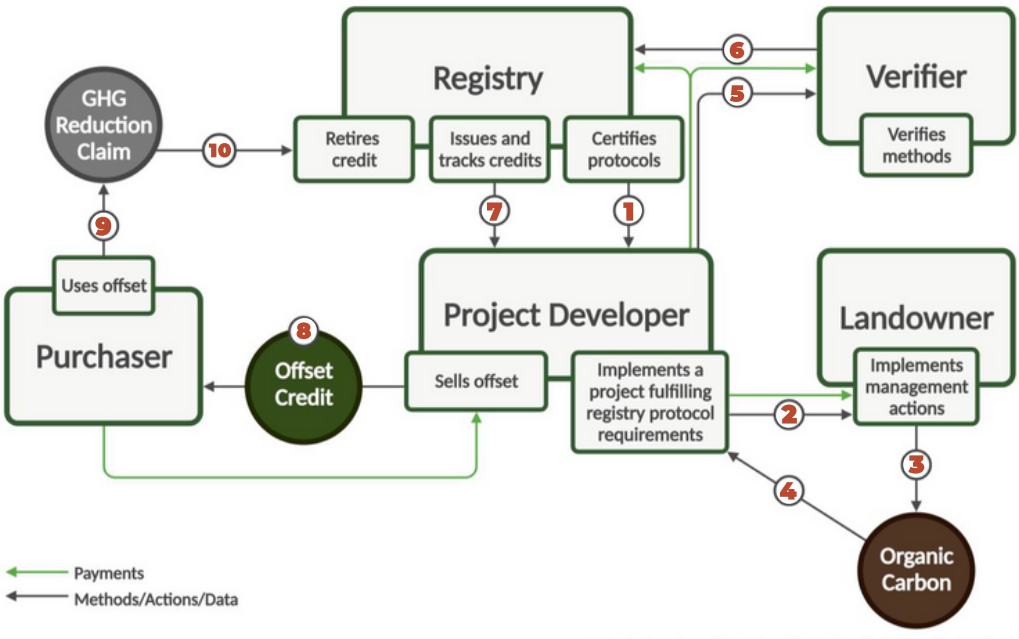
GENERATING CREDITS

1. The registry reviews and certifies protocols, which are large instruction manuals that can be used by anyone to generate credits.
2. A project developer approaches and develops a contract with a landowner that ensures all protocol requirements are met.
3. The landowner agrees to implement additional or new management actions on their land like changing grazing patterns, restoring degraded lands, or switching to no-till agriculture as well as meeting other conditions.
4. Once all requirements are met and management activities have been accomplished, the project developer takes the project data and estimates the amount of emissions avoided, net carbon sequestered, or carbon protected in the relevant carbon pools.
5. The estimate and all other project information is then verified by a third-party via site visits, review of documentation, and other actions.
6. If everything is verified, then the third-party verifier sends the information to the registry to issue credits.

SELLING CREDITS

7. The registry will then issue credits to the project developer. A credit is generally a unique serial number that is assigned to the project developer in the registry database and represents 1 tonne CO2e.
8. The project developer can then sell the credits to a purchaser. The purchaser can be the end-user who will claim the offset, or it can be brokers and aggregators who will further bundle offsets for later sale. Due to the long timelines required for these projects, sometimes credit projects are financed ahead of time through various financial vehicles including emission reduction purchase agreements (ERPA).
9. Once the credit is purchased by the end-user, it can then be used to claim an GHG emission offset and subtract the company's net GHG emissions by the credit amount (1 tonne CO2e).
10. The process of claiming the credit benefit is called "retiring" since the registry will retire the unique serial number of each credit in its database after it is used.

A model of the traditional voluntary carbon offset credit process showing steps 1 through 10.



*Adapted from Iowa State University's Ag Decision Maker File A1-76

Adapted from Plastina 2022.