Voluntary Carbon Markets and BCarbon: Using Texas Values to Address Climate Change

By Jim Blackburn, Taylor Tavormina, Jacqueline Buskop and Luey Garcia

Nature has a tremendous capacity to remove and store atmospheric carbon dioxide in soils, forests, coastal wetlands or even oyster reefs. The potential exists for these nature-based systems to remove and store as much as one to two billion tons of carbon dioxide, representing about one-sixth to one-third of the United States carbon footprint[1]. Unfortunately, the current international system of voluntary transactions does not work for United States landowners and has failed to deliver the huge potential that exists in nature-based carbon dioxide capture and storage systems. For this reason, a working group was formed at the Baker Institute at Rice University to develop a protocol for soil carbon storage that would open up the nature-based carbon market and work for both landowners and credit buyers. That system is BCarbon. BCarbon plans to bring significant new revenue streams to the United States agricultural community, generate equally impressive ecological co-benefits, and put in motion the largest grassland conservation program in U.S. history. It also will have a direct and significant positive impact on diversity and equity participation in the multibillion dollar nature-based carbon capture and storage segment of the global carbon market.

A. Evolution of BCarbon

BCarbon evolved from research that was begun at the Severe Storm Education and Evacuation from Disaster (SSPEED) Center at Rice University after Hurricane Ike. Ike generated a huge surge, much larger than is normal with a Category 2 storm, and it became clear that millions of low-lying acres along the Texas coast were at risk from future storms. The issue quickly crystalized as "how do we protect these low-lying areas, knowing that land use regulation Is simply not a viable option on the Texas coast?"

Environmental economists have been studying the intersection between ecology and economy for decades. Dr. Robert Costanza has written quite a lot about ecosystem services which are the services – the goods – that nature provides to humans. These goods are generally not included in our economy's concept of value, but these services are extremely valuable and should have dollar value as set out in Costanza's seminal article in *Nature* titled "The Value of

[1] Judith Schwartz, "Soil as Carbon Storehouse: New Weapon in Climate Fight?" Yale Environment 360, 2014, https://e360.yale.edu/features/soil_as_carbon_storehouse_new_weapon_in_climate_fight.

the World's Ecosystem Services and Natural Capital". https://www.nature.com/articles/387253a0#citeas.

In trying to identify ways to set aside and protect these low-lying areas along the coast, we developed the idea of paying landowners for the ecosystem services provided by the marsh, coastal prairie, and coastal bottomland forests. And although these lands provide many services for which Dr. Costanza identified dollar values, buyers for many of these services simply did not exist. However, one of these services – carbon sequestration – the removal of carbon dioxide from the atmosphere and storing it in either trees, soil, or oyster shells – seemed perfect for the Texas coast where we have significant sources of carbon dioxide emissions that might be willing to pay for carbon dioxide removal and storage.

Our research into carbon sequestration led us to the international voluntary carbon market that had been developed under the Kyoto Protocol of 1997 which was adopted under the United Nations Framework Treaty on Climate Change. This market ensured from the creation of the Clean Development Mechanism (CDM). The CDM was a mechanism under this treaty to allow a country with an emission-reduction commitment to provide for those reductions in developing countries by either arranging for emissions to be eliminated or by securing a natural sink for those carbon emissions.

Under the CDM, a set of rules were established for these voluntary transactions. Many of these rules have become categorized under the requirement of "additionality", an attempt to ensure that the credits being authorized for emission reductions are for real carbon reductions and not fraudulent projects. In figure 1, a flow chart is shown that was developed by the CDM Executive Board to help identify whether or not the actions resulting in carbon emissions reduction qualify as "additional". As set out in this flow chart, a proposed project will not be additional if required by law, a point with which we agree. Subsequently, a project is evaluated to determine if it has financial viability without selling carbon storage or reductions. If so, it is not additional. Similarly, if no barriers exist to project development, then it is not additional. And finally, if a project utilizes a common practice, it is not additional. These latter three requirements work against the optimization of atmospheric carbon dioxide reductions and the interests of private landowners.

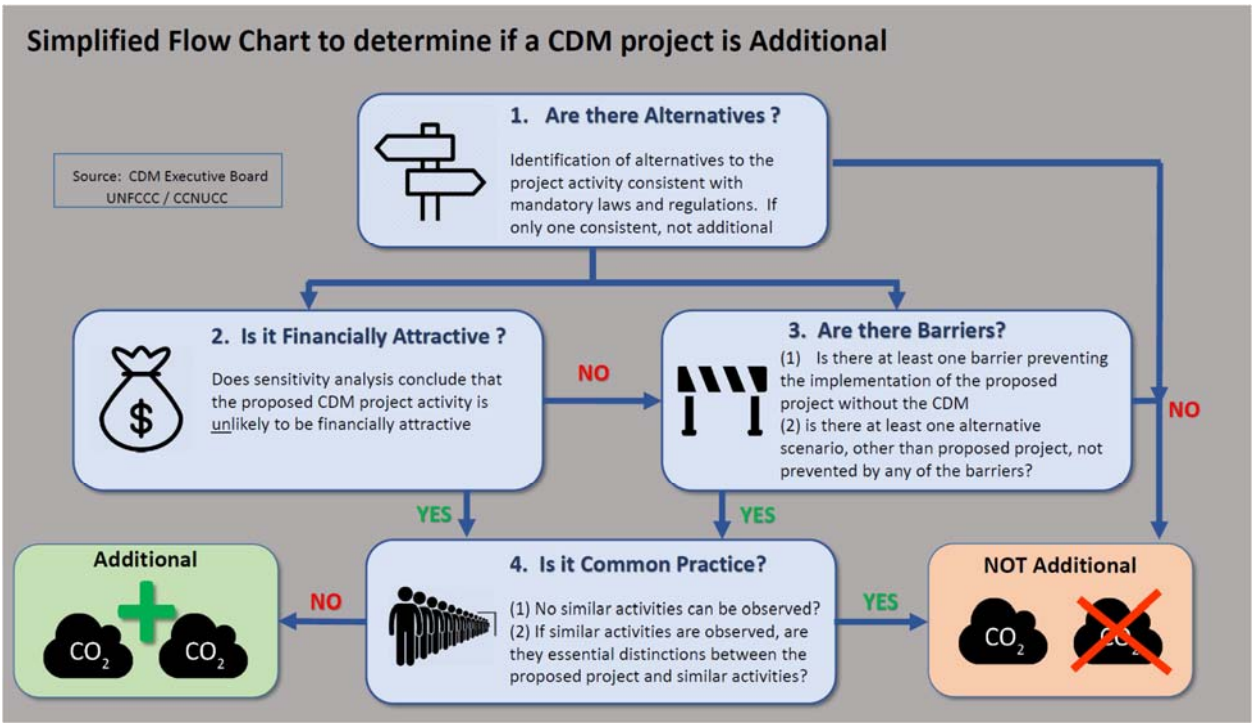

Figure 1. Simplified Clean Development Mechanism Flow Chart to determine additionality. Source: CDM Executive Board

The domestic voluntary carbon credit market at the time of our SSPEED Center research was dominated by protocols that adopted some or all of the requirements of the CDM process – a set of requirements often termed as additionality. Further, most of these standards required longevity commitments of from 100 years to 20 years to ensure that the carbon remained in the soil undisturbed, removed from atmospheric circulation. The bottom line, however, was farmers and ranchers along the Texas coast either did not qualify under these restrictions or did not want to participate in a system that restricted landowner choice and required temporal commitments beyond a time period when they could comfortably foresee the future.

After a thorough investigation, we decided to take this issue to the Baker Institute at Rice where Dr. Ken Medlock, the head of the Center for Energy Studies at Baker, and I formed a stakeholder working group facilitated by Robin Rather of Collective Strength in Austin. Starting in November 2019, its purpose was to examine this problem of a carbon trading system that did not work for landowners to try to determine if we could either revise this system or perhaps develop our own system for paying landowners for removing carbon dioxide from the atmosphere and storing it in the soil. We ultimately concluded that we would

have to develop our own credit issuance protocol due to the unwillingness of the existing credit issuing entities to make the changes necessary to bring about landowner participation.

In considering the creation of a standard, our stakeholder group was emphatic that we must be able to prove to buyers that carbon was being removed from the atmosphere and stored in the soil, hence our focus upon measurement rather than modeling. We decided not to offer credits for avoided conversion of existing carbon stocks, and we also decided not to offer credits for emission reductions from changed practices. On the other hand, our program had to work for landowners. If landowners would not participate, then it was not useful in helping us reach large scale reductions in atmospheric carbon dioxide levels.

After about a year of work by the stakeholder group, the decision was made to form BCarbon as a stand-alone non-profit with responsibility for issuing carbon dioxide emission storage credits that conformed with the BCarbon protocol that had been created and ratified by the stakeholder working group. As of late July 2021, BCarbon has begun to implement that protocol. 70,000 metric tons have been contracted to date with 10,000 tons of those credits being for carbon storage associated with barley production in the United Kingdom. All credits are currently being processed with credit issuance scheduled for late third quarter or fourth quarter 2021.

Today after about a decade of research and a year and a half of stakeholder committee meetings, BCarbon is underway and recently received a nice accolade by being evaluated by Carbon Plan as one of the two highest rated carbon credit systems in the United States. https://carbonplan.org/research/soil-protocols-explainer. As one might expect, this evaluation has generated significant interest in BCarbon. The remainder of this paper explains BCarbon – what it is and how it works.

B. The Eleven Principles of BCarbon

BCarbon was established by a stakeholder working group that was free and open to all who wished to participate and remains open and available to all. This working group now has about 170 members with about 70 institutions, corporations or governmental entities being involved. Most of the work of the group was conducted after the shutdown due to the pandemic, with meetings being conducted via ZOOM. All decisions of the group are by consensus, with much of the deliberating process being undertaken within committees which

report back to the full group. If you are interested in joining, contact me at blackbur@rice.edu. Over time the working group developed eleven principles that are the spine of the protocol, and which will be implemented by the BCarbon entity. These eleven principles are explained in the following paragraphs.

Principle 1. The credits under this U.S. system are for the removal of carbon dioxide from the atmosphere by photosynthesis and storage in the soil as carbon.

The BCarbon protocol is based upon photosynthetic processes that remove carbon dioxide from the atmosphere and store it in the soil. This is nature-based carbon capture and storage, as opposed to technology-based carbon capture and storage. BCarbon is centered around measurement and proof of removal and storage. BCarbon does not award credits for the avoided conversion of existing stocks of stored carbon. BCarbon does not award credits for emission reductions associated with changed agricultural practices. BCarbon does not award credits in the absence of confirmatory test data. As discussed later, BCarbon requires that the carbon that is the subject of the credit must actually be proven to have been deposited in the soil over a period of time.

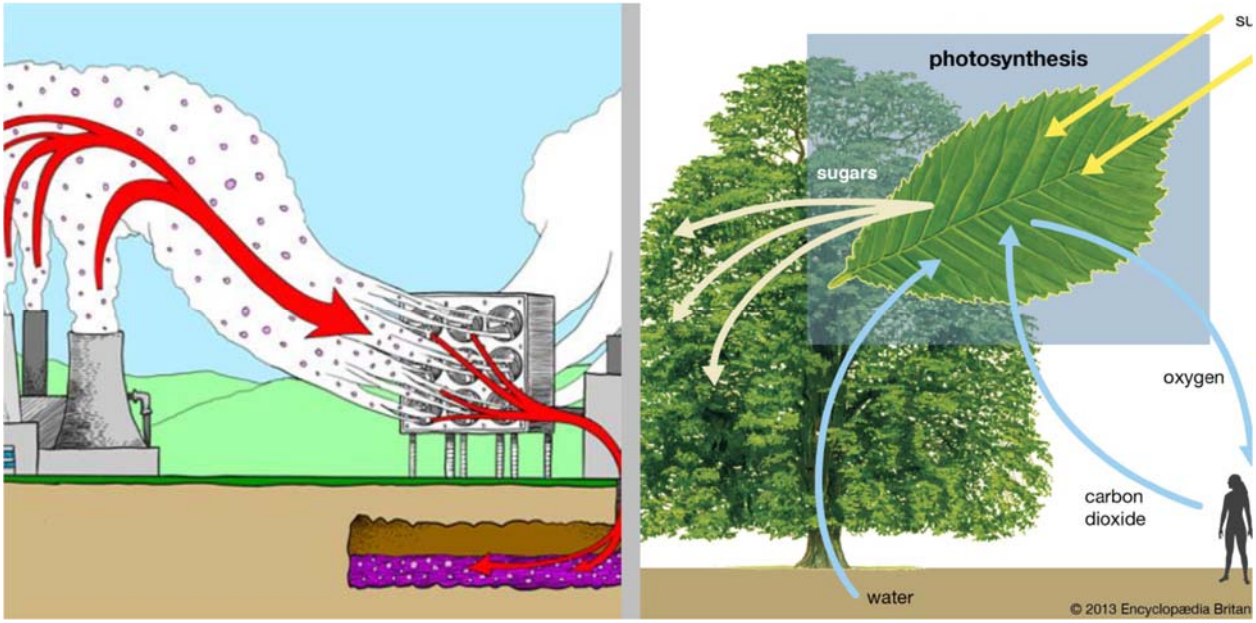

Figure 2. Illustration of two fundamentally different concepts of carbon capture and storage – one based on technology and one on photosynthesis. Photosynthesis image from Encyclopedia Brittanica.

Principle 2. Any landowner who sequesters carbon dioxide in the soil within a given calendar year is eligible for soil storage payments for that year.

The BCarbon protocol is based upon the concept of respect for and incorporation of property rights into the framework of this credit. If a landowner removes carbon from the atmosphere and stores it in the soil, that landowner has created a property right and may sell that stored carbon capacity to a willing buyer, just like they could sell potatoes. The stakeholder working group approached the problem of creating a fair and equitable trading system from the perspective that in order to create a market that could penetrate at scale, landowners had to embrace it. Therefore, this system is based on the right of the landowner to be compensated for the service of storing carbon dioxide on his or her property. More generally, we consider emitted carbon dioxide to be the property of the emitter. A BCarbon certificate means that the landowner is storing an emitter's carbon dioxide on their property and payment has been exchanged for that storage right.

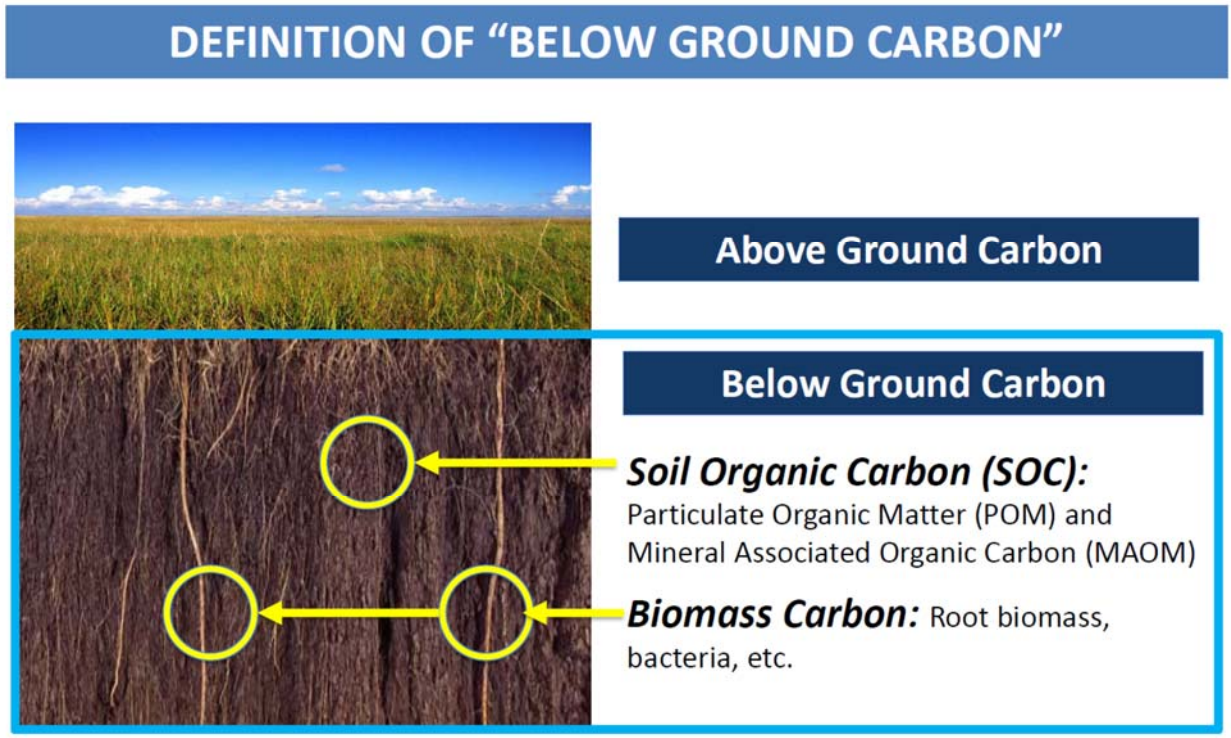

Figure 3. Image showing location and types of soil organic carbon. Image by GSI Environmental.

Principle 3. Soil carbon testing is required to validate transactions which can be based upon estimated values subject to verification.

A third key aspect of the BCarbon protocol is its requirement for soil testing. No credit may be issued unless it is supported by testing. To enroll in BCarbon, the applicant must submit and implement a soil testing program that meets the requirements found in the measurement protocol which can be found at https://bcarbon.org/doc/bCarbon-soil-storage-standard.pdf. BCarbon will accept applications from any landowner that believes that their land is sequestering carbon in the soil and is willing to support that application by establishing a set of statistically valid test results. BCarbon requires an initial round of testing at the initial application stage and requires a second round of testing after five years. Interim transactions are allowed based upon literature values and/or computer modeling and/or site data and information. These interim transactions are validated by the second round of testing at which point a

"true up" process occurs which will either lead to the issuance of additional credits because more carbon went into the soil than had been previously credited or to the landowner or applicant being responsible for making up any deficiency.

Figure 4. Field testing for carbon using a Giddings probe. Photo by Jim Blackburn

Principle 4. Transactions may occur on an annual basis after an initial declaration of intent to participate in the soil carbon sales program and the initiation of soil carbon testing requirements.

The credits issued by BCarbon are for the accrual of carbon over time. Data reviewed to date support the conclusion that carbon is added to the soil each year in significant amounts by photosynthesis and transfer into the roots of native grasses and to the soil surrounding the roots. Based on this understanding of the functioning of the grassland ecosystem, a yearly estimate of carbon storage is appropriate and will provide the basis for a yearly credit issuance pending "true up" at year 5 when the second round of testing is undertaken, and a final accounting completed. In some years, a landowner may choose not to apply for

credit issuance, if, for example, an extreme drought is occurring, or other production aberrations have occurred. BCarbon's review of proposed credit issuance will also take such factors into account in the decision as to what amount of credits to award for each acre in each year for which an application is submitted.

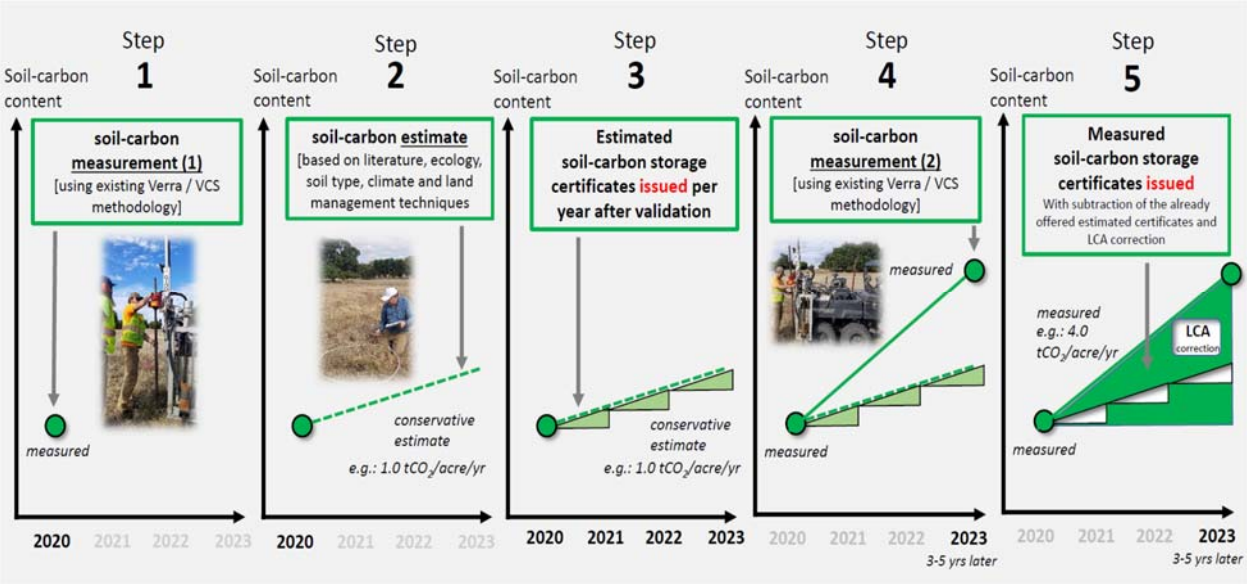

Figure 5. The steps in the award of BCarbon credits are shown above. Step 1 is initiation of testing. Step 2 is a soil carbon accrual estimation process based on literature, field data and modeling. Step 3 is the issuance of annual storage credits which are subject to the "true up" process shown in Step 4 when Round 2 of testing is completed, and the actual accumulation of carbon determined. In Step 5, the process of "true up" or "final accounting" is shown where either additional carbon credits are issued based on actual accrual or a determination is made that the project developer is in arrears and must undertake compensation. Image from Dr. Henk Mooiweer, Grassroots Carbon.

Principle 5. To become eligible for payments, a landowner must agree that the land will be maintained and protected in a way that promotes and protects soil health and landscape ecological health for ten years. Transactions occurring in subsequent years will require renewal of the ten-year commitment, creating a "rolling" ten-year requirement.

BCarbon requires that each landowner or project developer must make a contractual commitment to minimal disturbance of the soil for a minimum of ten years, a commitment which is renewed in each subsequent year for which a credit is issued. In this manner, a "rolling" ten-year commitment will be maintained. With a vibrant market increasing toward scale and prices expected to increase, the expectation is that landowners will be renewing this ten-year commitment over several decades as the United States and the world not only reach carbon neutral status by 2050 but perhaps move toward a carbon negative economy in the future.

Figure 6. Illustration of the rolling ten-year commitment using four consecutive annual transactions as a basis. Image by Dr. Henk Mooiweer, Grassroots Carbon

Principle 6. Landowners are not required to manage their land in any particular fashion. However, certain land management techniques will lead to greater carbon sequestration than will others.

BCarbon made the decision not to require any particular management protocol to be followed due to landowner hesitancy to accept outside directives on the use of their land. However, there are certainly management practices that

will lead to higher levels of carbon storage in the soil. Our principle is that the landowner is paid based upon the carbon yield. Poor practices will result in very low to no yield. The expectation is that ranchers and farmers will observe or hear about other landowners who utilize practices that generate significantly more tons per acre and therefore dollars of income per acre and will adopt those higher yield practices over time. BCarbon is based on the concept of market and the pursuit of income is a key aspect of the market system that is well understood by farmers and ranchers. BCarbon will develop a set of best management practices over time that will be available to assist those landowners who would like information about how to increase carbon yields on their land.

Figure 7. Photographic evidence that different management practices can lead to different grassland quality in the same climate and soil conditions.

Principle 7. A buffer account will be maintained to ensure that all credits issued under this standard are protected against failure risks.

Both published literature and our BCarbon stakeholder team support the proposition that soil carbon is very secure from a permanence standpoint.[2] Although the amount of carbon in the soil fluctuates daily and seasonally with respiration and sequestration processes, the literature supports the conclusion that soil carbon buildup is stable over time if the land is managed to avoid surface disruption and major land use change. BCarbon does not award credits for above ground carbon so fire is not a major concern. However, a buffer account will be maintained as a form of insurance against the possibility of default. 10% of all credits for each project applicant will be issued in the name of BCarbon and maintained in a BCarbon buffer account. This provides resilience for the BCarbon credits.

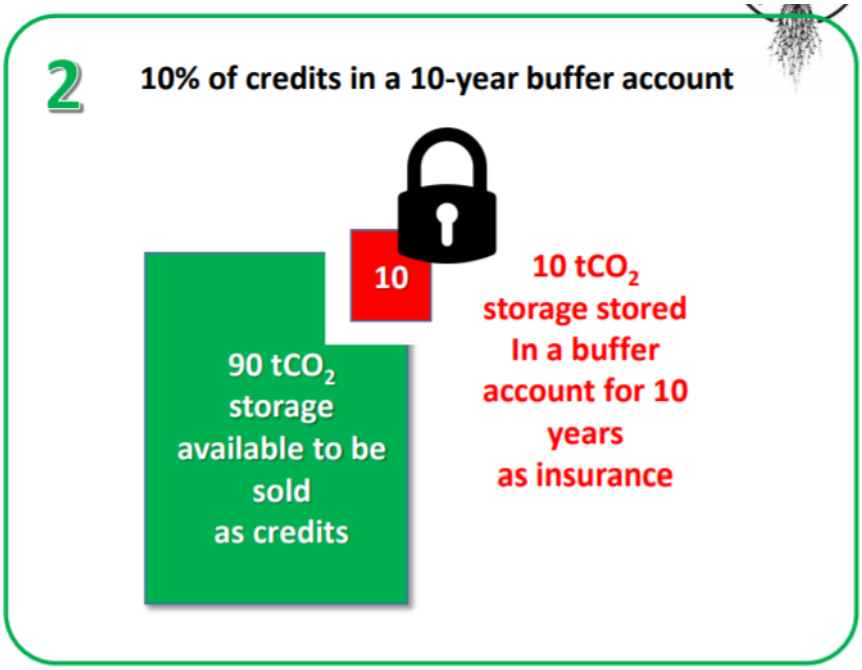

Figure 8. Illustration of the buffer account concept. Image by Dr. Henk Mooiweer, Grassroots Carbon.

Principle 8. It is anticipated and specifically allowed that a third-party entity will act as an assembler of credits for purposes of expediting the communications and exchange between buyers and sellers.

[2] Katherine Dynarski, Deborah Bossio and Kate M. Scow, "Dynamic Stability of Soil Carbon: Reassessing the "Permanence" of Soil Carbon Sequestration," Frontiers in Environmental Science 8, (2020): 1-14, doi:10.3389/fenvs.2020.514701.

It is specifically understood that many landowners will either not be able to or will not wish to prepare a credit application and undertake to design and implement the testing protocol. In this regard, Principle 8 specifically provides for the participation of an entity as a project developer or assembler. Such a party will expedite protocol compliance procedures while providing expertise to the landowner while also acting as an intermediary with the buyers. Of particular importance is that the assembler can help BCarbon reach scale, a key necessity for nature-based solutions to emerge and contribute to carbon dioxide level reduction.

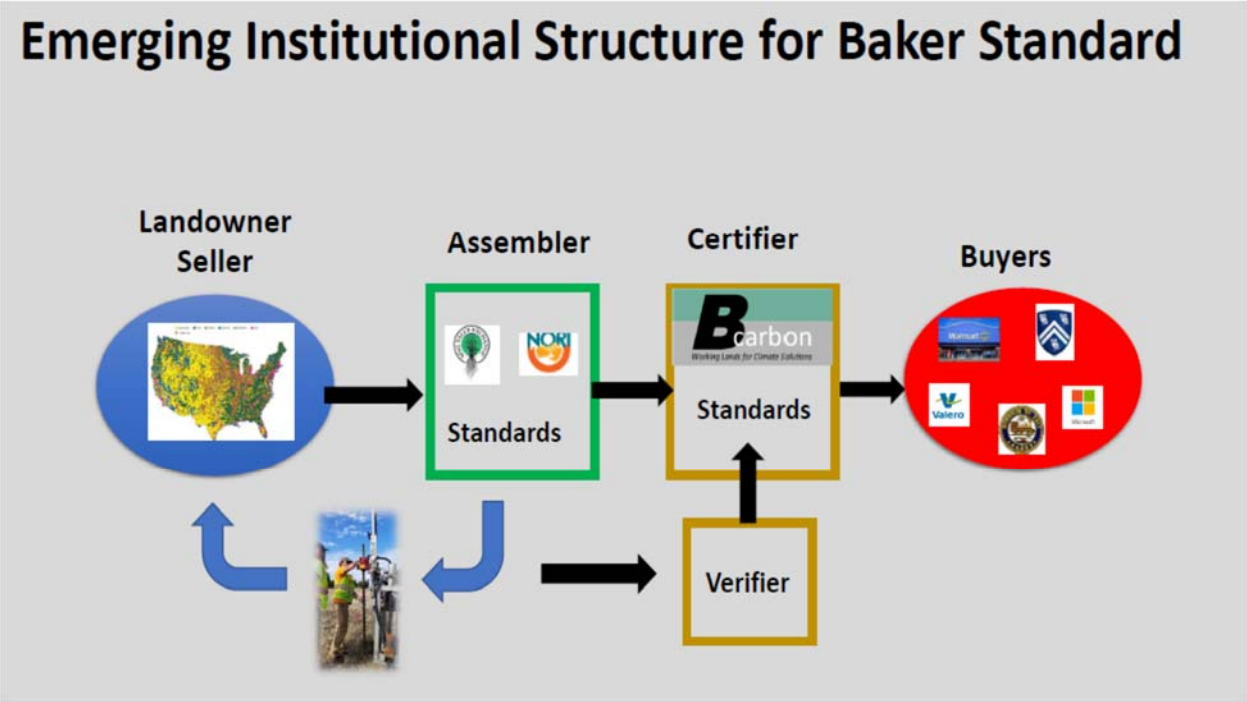

Figure 9. Flow chart of participants in the BCarbon credit trading structure. The role of the assembler is to work with landowners to assist in the cost of testing and in the credit application process. Credits are issued by BCarbon to the assembler or landowner who directly transfers them to the Buyer with all transactions maintained on a block chain system maintained at BCarbon. BCarbon is also responsible for verifying that the application process and credit development process is correctly followed.

Principle 9. All credits issued under this standard must be certified.

To provide buyer security and establish credibility, credits eligible under the BCarbon protocol must be certified. BCarbon certification requires that an independent third party retained by BCarbon verifies that eligible credits have fulfilled all protocol requirements and represent real reductions in atmospheric carbon dioxide through storage. . An assembler must follow the BCarbon requirements to be eligible for credits; however, merely following the BCarbon requirements is not sufficient to be able to claim certification. First, BCarbon undertakes an internal review of all applications for carbon credits. Second, applications are subject to independent third-party verification. This third-party verification provides proof of compliance that leads to market security and is essential for buyer trust. After verification is completed, BCarbon certifies the credit. At the outset, BCarbon is charging $1 for each ton of carbon credit certified and verified through the BCarbon process.

Principle 10: All credits certified under this standard may be bought and sold until retired, with all transactions being recorded with the certification entity.

The goal of BCarbon is to implement a vibrant market that will increase rapidly in scale, hopefully covering hundreds of millions of acres and transacting upwards of a billion tons of carbon credits per year. To achieve such a vibrant market, credits may be transacted through multiple individuals or entities until they are retired. To avoid double counting, all transactions and subsequent credit retirement will be maintained on a block chain technology system that will allow all issued credits to be traced back to property and landowner of origin and will provide transparency and traceability for every issued credit. The importance of the need to create a market cannot be overstated. Market is the key to scale, and scale is the key to impacting the carbon dioxide levels in the atmosphere. Successful development of this market is one major pathway toward success in battling carbon dioxide levels in the atmosphere. Market alone does not remedy the effects of climate change; however, it is an integral component of achieving the scale necessary to have an impact on global atmospheric carbon dioxide levels.

Principle 11: Develop a soil carbon credit trading program that embraces diversity of people, is equitable in policy and practice and inclusive of power, people and culture, recognizing that this is an ongoing process that must have full transparency.

One of the unique principles of the BCarbon Protocol is the requirement that diversity, equity and inclusion concepts must be developed and implemented as this protocol develops. One key equity benefit of BCarbon is that it offers the only scalable and affordable solution to remove upwards of a billion tons of carbon dioxide from the atmosphere, thereby providing a major alternative to address climate change that will disproportionately affect lower income and minority communities. But that is not enough. Through the stakeholder working group, BCarbon is seeking to identify and specifically include minority landowners in the carbon dioxide credit program. Many such tracts may be smaller in size and require subsidies for testing, for example. Our metrics standards have been adjusted to encourage group projects to address small landownership issues. Additionally, many such tracts are forested and for this reason and others, BCarbon is investigating the implementation of a BCarbon forest standard. Further, an urban agriculture credit category for carbon reductions represented by locally grown vegetables, fruit and meat is also under consideration as is training for minority students and involvement of Historically Black Colleges and Universities. In short, BCarbon is making a concerted investigation of these approaches and is committed, through Principle 11, to act on this issue.

C. **Environmental Co-Benefits Beyond Carbon**

Once a nature-based carbon dioxide capture and storage system has been well established, the potential for ecological co-benefits to also be realized is huge. Keep in mind that these nature-based carbon systems that are the heart of the BCarbon credit protocol are a natural part of the Earth's circular economy. Improvements to the carbon cycle that are based on ecological restoration will restore other ecological functions such as ensuring that the rain that falls enters

the soil rather than immediately running off, and fish and wildlife and endangered species benefits will also accrue.

The SSPEED Center first began investigating carbon storage as a way of paying landowners to keep low-lying coastal lands natural. As such, it could provide a non-structural flood storage buffer along the Texas coast as shown in Figure 10. It is justifiable to include some payment per acre within the flood buffer zone to increase the landowner's income in addition to that which is provided from cattle grazing and carbon credits. This would increase the incentive for landowner participation over time. Payments to the same landowner for multiple ecological benefits is called stacking and is allowed and encouraged under the BCarbon system because a landowner's financial success is our greatest insurance that these practices will continue in the long term.

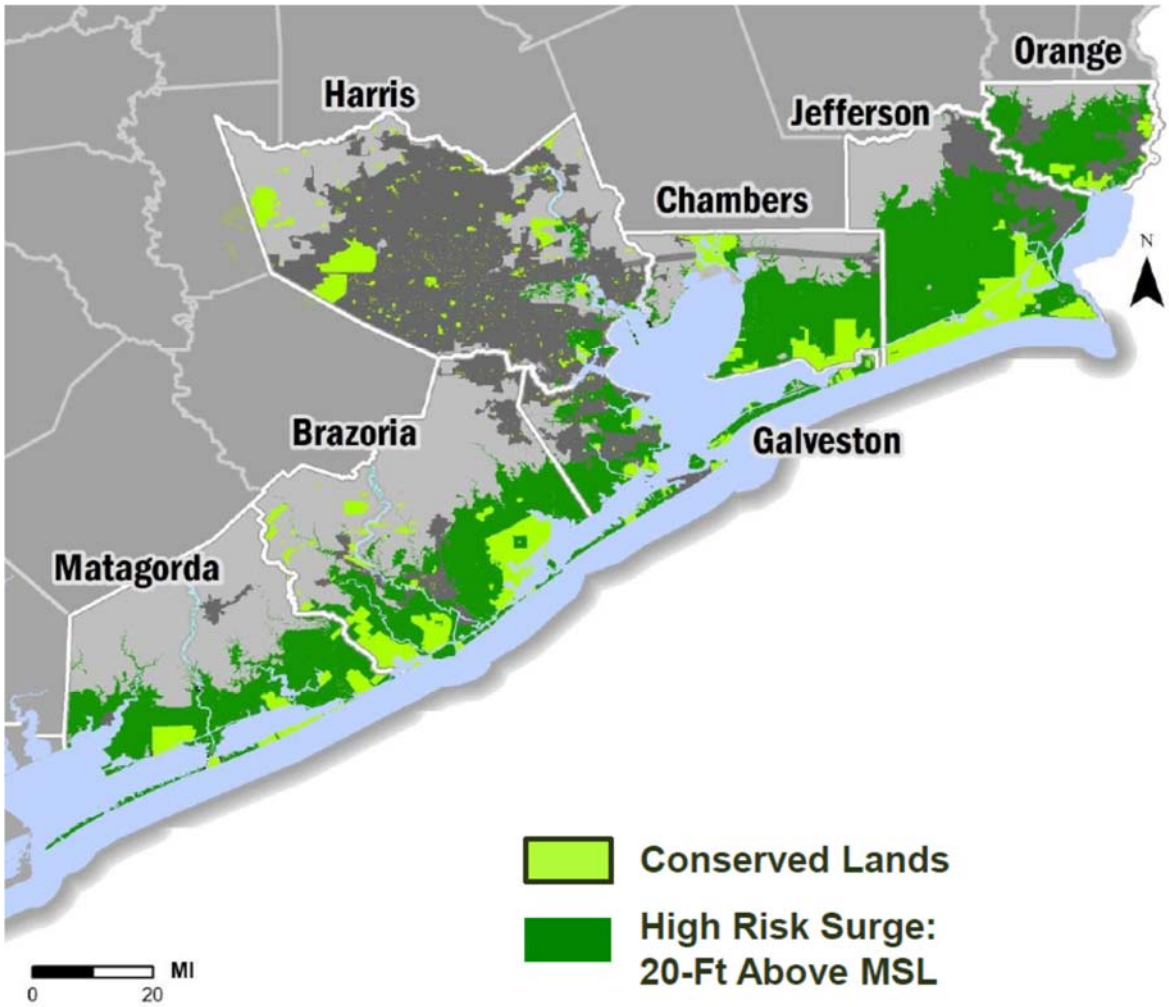

Figure 10. A depiction of the SSPEED Center non-structural flood control project to potentially be accomplished through the use of landowner payments for carbon sequestration, representing an environmental co-benefit of nature-based carbon storage. The areas in light green are lands that are protected by federal, state and non-governmental organizations. The lands in dark green are those which would be considered the non-structural natural buffer for the Upper Texas coast and in a non-structural flood protection context would be considered prime for inclusion in the BCarbon carbon payments concept.

There is another flood reduction co-benefit that is based upon the fact that restored grasslands allow for rapid infiltration of rainwater. Rather than having significant, immediate runoff, restored grasslands take rainwater deep into the soil. If a large geographic area were converted back to native grasslands, for example, the peak flooding flow downstream would be reduced to some extent. Where there is significant downstream development that is threatened by the increased rainfall rates associated with our changing climate, paying ranchers and farmers to restore native ecosystems whether prairies or forests is well worth considering. In combination with carbon payments, these flood reduction payments will increase the incentive for participation by landowners, potentially alleviating the need for massive infrastructure improvements such as levees and dams downstream.

Flooding is not the only potential co-benefit from a nature-based carbon credit program such as BCarbon. It is well known that restored grasslands with their excellent root systems will bring more water into the soil. More water in the soil means greater resilience for grass and certain crops and potentially reduces the need for irrigation where practiced. What we are also interested in is the potential to increase uppermost aquifer groundwater levels that will in turn restore natural seeps and springs. This enhanced stream flow co-benefit, if real, would be an incredible boon to coastal freshwater inflow concerns on the Texas coast, with perhaps payments for a new water right for “created” water from restoration. That may not happen, but we have to think creatively as we develop this new ecology-based economic system and make no mistake about it – that is what we are doing.

D. Some Legal Implications

Carbon as a Property Right: Soil with carbon storage potential could become an important property right that is potentially severable from other surface rights. Growing carbon markets will likely increase the value of carbon storage making soils rich in storage a potentially important value to the landowner. Soil seems well established as part of the surface estate, meaning that carbon storge within the soil is a surface right, not a mineral right.[3] On the other hand, the carbon dioxide that is emitted may also be considered the property of the releasing entity as has been established for hazardous waste by the manifest system under the Resource Conservation and Recovery Act (RCRA) and hazardous substances by laws such as the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Arguably, BCarbon establishes a chain of property rights whereby the emitter of the carbon dioxide can ensure that their property – the released carbon dioxide – is stored in the soil of a landowner within the surface estate, creating a nice pathway from emission to storage, all within the concept of property rights. This property rights nexus might become important if attempts are made in the future to restrict the use of soil carbon storage by regulation.

Potential Role of Growing Climate Solutions Act, S. 1251: The Senate of the United States just passed S. 1251, the Growing Climate Solutions Act (GCSA) by a 92-8 margin with Texas Senators Cornyn and Cruz voting for the bill, an amazing bipartisan showing. The GCSA is intended to grant the United States Department of Agriculture (USDA) authority to facilitate the participation of farmers, ranchers, and private forest landowners in existing voluntary carbon markets. Additionally, the GCSA attempts to protect landowners by requiring parties that work with landowners relative to soil carbon storage – technical consultants and third-party verifiers – to be certified in the soil carbon protocols maintained on a list by the Secretary.

One goal of the GCSA is to reduce barriers for entry for landowners seeking access into the voluntary carbon credit market with a particular focus upon socially disadvantaged groups. Secondly, the Act creates the Greenhouse Gas Technical Assistance Provider and Third-party Verifier Certification Program. In general, the USDA will certify those who are working directly with landowners as being proficient in various protocols such as BCarbon so that a landowner will

[3] Gifford-Hill & Co. v. Wise Cty. Appraisal Dist., 827 S.W.2d 811, 817 (Tex. 1991) *citing Psencik v. Wessels*, 205 S.W.2d 658, 658 (Tex. Civ. App. 1947) (relying on the definition that mineral rights are "restricted to such mineral and mineral substances that were commonly regarded as minerals as distinguished from the soil").

know that a technical consultant working with them is both registered with USDA and meets minimum technical competency requirements. Protocols such as BCarbon would seek inclusion in a list of protocols to be maintained by the Secretary of Agriculture. Further, if SB 1251 becomes law, the Secretary would be required to produce a comprehensive report regarding the voluntary carbon market, and this report is sure to attract much interest in the agricultural carbon community.

E. Conclusion

I started practicing environmental law in 1972, and my career has spanned the development of U.S. environmental law. The initial wave of environmental law thinking represented end-of-the-pipe fixes to problems resulting from a linear economic system that extracted, manufactured, used and discarded, with an emphasis on ever-increasing consumption. Today, we are challenged to develop a new way of thinking about economy. To my mind, the economy that we are developing in response to both the climate and the plastic waste crises will move the world to an economy that is much more in sync with nature's cycles. BCarbon is part of that evolution in thinking with a focus on creating and maintaining the trust of the landowner and the buyer. Without full participation of these two entities, nature-based carbon capture and storage will fail.

It is also important to consider that with BCarbon and other nature-based protocols, we are creating a new economy to address an environmental problem created by our old economy. We have seldom if ever used economy to solve a problem created by our old linear economic system. The environmental laws that we all work under are "band aids" on this linear economy based on extraction, manufacturing, use and disposal. To my mind, solutions such as BCarbon are the key to the future where our priority is to understand and restore ecological capacity within the natural cycles of the Earth. This new system does not require regulation but rather market enablement. BCarbon liberates the landowners and the buyers to create a new economic value in nature-based carbon capture and storage. This is a part of the circular economy of the future and represents a distinct change from the way we have addressed environmental harms in the past.