Carbon Market Opportunities For Forest Landowners

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Carbon Sequestration? What's this all about?

The greenhouse affect, global warming, biofuels, alternative or "green" energy, carbon neutrality, emissions reduction, carbon sequestration….these are just a sample of some of the terminology that has become increasingly prevalent in the mainstream media today. The global initiative to reduce the impacts of fossil fuel consumption combined with the controversial issue of dependence on foreign oil sources has developed into what could be considered a renaissance period for the international community when it comes to environmental policy and responsible environmental practices. It certainly appears that the time has arrived for real progress on the issue of global warming and its impacts on our society.

The global initiative has manifested itself best in the form of a key piece of legislation called the Kyoto Protocol. Introduced to the United Nations in 1997 in Kyoto Japan, this landmark set of regulations put in place emission reduction targets for participating industrialized countries, while developing countries (including China) were given no reduction targets. The goal is to reduce the collective emissions of six greenhouse gases (GHG's) by 5.2% compared to the year 1990 over the five year commitment period of 2008 to 2012 (UNFCCC). Today nearly all countries have both signed and ratified this commitment to greenhouse gas reduction. Only the United States and Australia have yet to commit to the protocol, citing inequities in the program. The development and implementation of greenhouse gas mitigation programs in Kyoto compliant countries has developed creative market based mechanisms to buy and sell carbon financial instruments or carbon "credits" by both public and private entities globally.

Even though the Clinton administration's decision (carried on by the Bush administration to date) not to sign the protocol has precluded US participation in the rapidly developing greenhouse gas programs overseas, considerable progress has been made domestically. The significant concern over global warming and the growing investment and market opportunities that appear to be developing elsewhere as a result of cap and trade programs has sparked the development of many initiatives here in the states. Across the country, the federal government, state or local governments, ngo's, not for profit organizations, and private enterprises have worked to develop various greenhouse gas registries, cap and trade programs, and other market mechanisms. Without over-arching requirements such as Kyoto or federal regulation, most of these initiatives have been developed independent of one another resulting in differing ideologies, policies, and program requirements. Some of the more prevalent of these initiatives include the US DOE 1605b program (registry), the California Climate Action Registry, the Regional Greenhouse Gas Initiative, and the Chicago Climate Exchange (CCX). Registries provide entities with the means by which to calculate,

track, and report changes in GHG emissions or increases in carbon storage over time. These bodies establish the technical accounting rules that standardize GHG and carbon accounting and ensure consistency in all participant accounting systems. Carbon markets are a combination of the rules set from a registry and the platform on which carbon offset credits (usually metric tons of CO2 equivalent or MtCO2e) are traded, or marketed to consumers.

Other prominent efforts here in the US include the Regional Greenhouse Gas Initiative (RGGI) in the northeast and the California Climate Action Registry (CCAR). To date nearly all aspects of participation in these programs and any associated markets is voluntary. Programs such as RGGI and CCAR however will become our first mandatory domestic programs over the next few years. It appears inevitable that the US will in the near future have a mandatory cap and trade program to mitigate greenhouse gas emissions. This program could take the form of the mandatory market based SOx and NOx programs that have had success in mitigating acid rain. It is however, safe to say that the results of these early domestic voluntary GHG registries and carbon markets will have a heavy influence on the impending mandatory federal program that is expected to develop.

Carbon Opportunities From The Forest

So, what does this all mean for forestry? There are four main methods by which an emitting entity can reduce its emissions to get under a cap. These include the reduction of point emissions through new processes or technologies, reduction of the entities' carbon "footprint" by using alternative fuels or energy sources such as wind or solar power, the purchase of offset credits from another entity that has reduced its emissions below the cap, or the purchase of offset credits from sequestration projects, or projects that fix carbon in some way. Forests are one type of sequestration project that can participate as an offset in most registries and markets today. Other examples would include geologic and agricultural projects. When considering forestry offset projects, there are four primary types: afforestation, reforestation, managed forests, and forest conservation projects.

Afforestation and reforestation projects are widely recognized and accepted by existing markets and registries. As you can imagine, carbon stocks are relatively simple to track in these cases as we know the number of stems per unit area, species mix, growth rates, etc…to a high degree of assuredness. The high degree of assuredness in these forestry projects makes economists, accountants, investors, and anyone else interested in offset credits, very comfortable. Participants also feel very comfortable with the notion of additionality in this type of project. In the case of tree planting projects it's easy to see that a deliberate action has taken place to establish a forest on a site which will grow and sequester carbon above and beyond what might have occurred there without the planting. These types of projects are important to the overall accomplishment of the global reduction in GHG and are seeing growth. The unfortunate reality however, is that there is limited acreage available for this type of project. It is highly unlikely that there is enough available acreage (here in the US especially) to plant ourselves out of the climate change problem.

Most forest conservation projects that are in place have come from areas of high conservation value such as the rain forests of South America or Latin America. These projects are

dominated by forest owners that take specific actions to prevent the conversion of native forests to a non-forest use. These projects are particularly attractive to conservation groups looking for a means by which to generate alternative revenue streams from the restoration of habitats or preservation of sensitive ecosystems.

The forestry offset type that has perhaps the greatest potential here in the US is the managed forest. Forests that are managed for some mix of objectives and benefits such as recreation, biodiversity, wood products, esthetics, and/or high quality water, benefit society most by providing all of these co-benefits along with clean air and reduced GHG buildup in the atmosphere. This suite of environmental services is matched by no other type of offset. Unfortunately, until recently, managed forest offset projects have seen limited growth in the marketplace. This can be tied to a variety of reasons including: additionality, leakage, and permanence.

The Challenges

Leakage, or the intentional or unintentional actions that may take place outside the specified project bounds that result in a net increased emissions profile, is a real but surmountable challenge for managed forests. Likewise, permanence of stored carbon in forests can also be somewhat problematic for managed forests, but can be handled in a variety of ways. Neither of these challenges however, are more problematic for forestry than the concept of additionality. Additionality in managed forests appears to be a particularly hot topic in policy and rule set development. Additionality refers to the actual difference between the project's emissions or sequestration profile and that of the baseline scenario (forecast emission levels in the absence the project). Many initiatives, including Kyoto, have set bounds around the additionality issue referring to the concept of "man induced change". Depending on your point of view, managed forests could be considered to have no additionality, because they were likely managed prior to entering the markets or registries that pertain to carbon. There are many groups that resist giving credit to offset providers that may get credit for sequestration that may have happened anyway. This is particularly the case with some environmental groups that are focused on reduction in point emissions and see offset projects in general as a less than legitimate mitigation method for entites that emit greenhouse gasses. As a result, not all markets and registries do or will recognize managed forests as legitimate offsets.

When exploring those markets that do recognize carbon sequestration through managed forest such as California's CCAR program and the Chicago Climate Exchange (CCX), two mainstream approaches to additionality in managed forests are apparent. One is the business as usual or BAU approach, the other is the base year approach. The BAU method only considers carbon accrued on the forest project above and beyond what would have been there as a result of normal management practices. This method can prove very problematic from a practical perspective. Take for instance a forestry project that proposes to improve the management of a forest to enhance forest growth. The growth of a forest over time is due to both natural change and to some degree the management choices made by the landowner. There is no credible way to separate these two affects so if carbon credits are limited to those caused solely by management action, any claim can be suspect (R. Neil Sampson, Pres. The

Sampson Group). The BAU approach also creates the potential opportunity for project developers to "game" the system by minimizing forecasted sequestration when establishing the base reference scenario therefore artificially maximizing the additional sequestration levels of the project.

This approach is also problematic from an economic perspective. While the income stream from the sale of carbon credits is attractive, carbon management and the income that is generated by participation in a market program will not be substantial enough to result in major paradigm shifts in management practices or harvest levels beyond what is happening today. This economic reality results in a low likelihood that adequate amounts of carbon credits will be generated using BAU on a managed forest as "additional", and therefore eligible to be marketed. The economic impact on a potential forest carbon project owner is significant as market entry and participation costs may not be exceeded by the revenue from the sale of carbon credits from the project for a considerable length of time. The resulting limited real returns under the BAU approach combined with the reality that the project developer could "game" the system makes this approach less than desirable, resulting in the development of the other mainstream methodology or base year approach.

Many stakeholders and policy groups argue that a sustainably managed forest is (in the long term) carbon neutral. These groups suggest that eventually, sustainably managed forests reach or come close to a fully regulated or "model forest" condition where growth is very close if not equal to harvest plus mortality. From a conceptual point of view this is most likely true. Domestic carbon markets however are not currently requiring indefinite commitments to the maintenance of carbon stocks. As a result, one could argue that any landowner or managed forest carbon project owner that is willing to commit to a positive net flow of carbon from their ownership during the pre determined commitment periods associated with the current market opportunities should be allowed to access the market platform with legitimate credits. This is the ideology that has resulted in the base year approach to additionality. The base year approach requires that a baseline estimate of total carbon stocks be developed in the first year of participation, after which net change is tracked annually. Any positive net flow of carbon on the project after the initial enrollment is considered a result of direct management choice and is therefore, additional. The project owner may choose to either market or bank the resultant carbon credits from year to year. Conversely, any negative flow of carbon on a registered project is also considered, resulting in a requirement to compensate the market.

A Test Case For Sustainably Managed Forests

So what is the income potential of participation by managed forests in carbon markets? Over the past few years we have been asking that question ourselves. In order to fully understand the potential for managed forests as offset projects we decided to test the actual performance of a tract of managed forest, which we'll call the K tract. The K tract is a 9,000 acre (97% forested) privately owned tract of high quality hardwood forest in the northeastern US. The tract has been managed for timber production for a considerable length of time by both industrial and private owners. At the date of the analysis, the tract is comprised of a mix of age classes distributed in even aged stands across the landscape.

Although there are a variety of market opportunities available for carbon offset credits at this time, our analysis is based on the most well developed open market available here in the US, the Chicago Climate Exchange (CCX). CCX is the world's first and North America's only voluntary, legally binding rules-based greenhouse gas emission reduction and trading system. It started its first pilot period in 2003 with 13 members. The CCX now has nearly 250 members including companies such as; Rolls Royce, Dow, Dupont, Ford, IBM, IP, Mead Westvaco, Stora Enso NA, also municipalities such as the State of New Mexico, cities of Boulder, Chicago, Portland, Berkeley, Oakland and many others.

Our test was built to answer one primary question: "How would the K tract have performed as a forestry offset project from 2001 to 2006 had the landowner entered the Chicago Climate Exchange without changing their management plan?" Our test involved the establishment of baseline carbon stocks from existing forest inventory, modeling growth using the CCX approved NE TWIGS growth model, and removing statistical harvest volumes each year, all under the CCX rule set for carbon accounting. Other edits included adjustments for other activities such as forest road and well site construction. It should be noted that during the analysis period, total harvest levels equated to roughly 40% of overall growth. This is a key factor in the calculation of net volumes of carbon dioxide equivalent for the project.

Before we discuss the analysis it would be appropriate for us to review the main program requirements currently in place for CCX managed forestry offset projects. The listing below highlights the project requirements and other dynamics for the CCX program.

Key Aspects of the Chicago Climate Exchange Program for Managed Forest Offsets

- Commitment period: Until 2010
- Accounting and Reporting: Reports are required Annually at the project level
- Verification: Audits required annually
- Carbon Pools Recognized: Above and below ground living tree biomass only
- Approach to Additionality: Base year approach
- Sustainability: 3rd party certification or equivalent required
- Market Access: Trading by members or aggregators only
- Reserve level required: 20% of credits registered annually

In order to get our analysis started it was necessary to establish our project baseline carbon stocks for the beginning of 2001. To accomplish this task we converted per species volume estimates from a 2001 random sample forest inventory (with statistical results of +/- 10% at 95% confidence) to its carbon dioxide equivalent. The ending result was overall estimates of carbon stocks that averaged 28 MtCO2e per forested acre. Using this baseline data and the actual harvest levels along with estimates of growth from the NE TWIGS growth model, net sequestration for the K tract was calculated for each year. The results revealed that our managed forest sequestered between 12,637 and 16,560 MtCO2e each year, or an average of about 14,850 MtCO2e annually. On a per acre basis, our project site sequestered an average of 1.69 MtCO2e per forested acre per year.

After calculating the sequestration levels for our forest, we then calculated the estimates of income through the sale of the resulting carbon "credits" on the CCX platform. At the time of the project carbon credits sold for values between $.95 and $3.70 per MtCO2e. Using these historical prices for carbon, our project yielded gross income of $135,738.00 for the analysis period. This income translates to about $2.57 in gross revenue per forested acre per year.

The cost side of our analysis breaks the various costs for the project into two categories, start up costs and participation costs. Start up costs can include forest inventory costs, costs of third party certification of sustainability (such as SFI or FSC), and lastly, project preparation costs. Forest inventory and certification costs are highly project participant specific and therefore may not be incurred by everyone. These cost components are however, important to consider as they could be viewed as real market entry costs for some landowners. Project preparation and accounting costs are items that will be realized by all participants as they enter the carbon market. For the K tract, we considered the inventory and certification costs to be zero as all requirements for these items are currently met. Project preparation costs for our analysis of the K tract were estimated to be $1.70 per forested acre.

The second group of costs are the participation costs. These costs include fees associated with aggregation, trading, reporting, and verification. These costs are incurred after the project is approved and are dependent on the scope of the project and the amount of carbon generated for trading or banking. For the K tract this equates to a total cost for participation during the project period (2001 to 2006) of $8.74 per forested acre.

The end result of our economic analysis for the K tract revealed a net revenue from the sale of carbon credits of $43,959, or about $.83 per forested acre per year. These results are summarized in the table below:

Summary of K Tract Test Case Results	**CCX**
Total MtCO2e Sequestered (Six years)	**89,105.00**
Average annual sequestration	*14,850.83*
Average annual sequestration per forested ac	*1.69*
Total Revenue	**$ 135,738.69**
Total Costs	**$ 91,779.53**
Total Net Revenue	**$ 43,959.16**
Annual per forested acre net revenue	*$ 0.83*

While $.83 per forested acre per year is a positive economic outcome, it is hardly worth getting excited about. Landowners faced with the decision as to whether or not to enter this ecosystem market will not be likely to do so at this level of financial incentive.

Carbon in Harvested Wood Products:

As we consider the outcome of this historical analysis and plan for what the future may hold for managed forests in carbon markets, it is important to keep our eye on policy and rule set

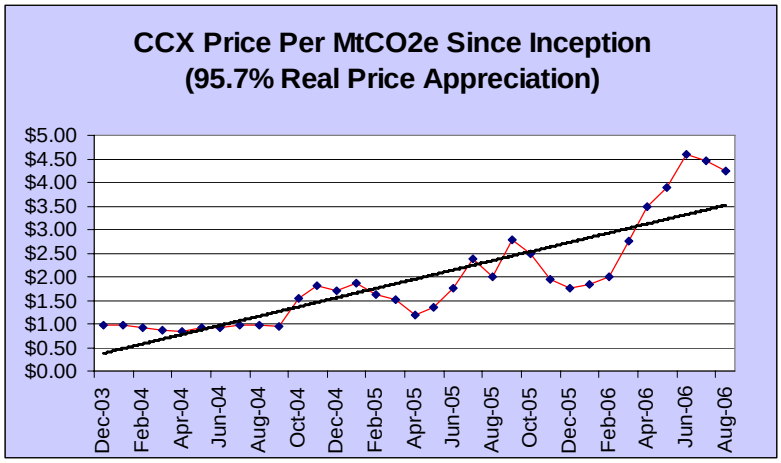
developments that are on the horizon. From a broad perspective, as we think about accounting for sequestered carbon from our forests it's easy to understand that growth and harvest are the key factors influencing our net carbon stocks. Growth represents our sequestration and harvest equates to our "emission". The problem with this train of thought is that the harvesting of trees does not fully release the associated carbon stocks to the atmosphere. Wood is made into products, which then have a lifespan of their own. Consequently, the wood tied up in harvested wood products in use contains sequestered carbon that can be accounted for and is not emitted at the time of harvest.

Considerable work has been done in the research realm regarding the lifespan of various wood products. This work has been assembled and considered in terms of carbon sequestration by some organizations in order to develop an accounting methodology to track the amount of sequestered carbon remaining in use over time. The two mainstream methodologies for carbon accounting in this regard are the US DOE 1605b guidelines and the NCASI carbon depreciation model. Both organizations approach the depreciation of wood products in use in a similar fashion, but with slightly different results. These accounting rules for harvested wood allow the project owner to "take credit for" or retain ownership of carbon tied up in wood products for a period of time after the raw material is harvested. Supported by research, these methods are gaining acceptance in the carbon markets today.

If we implement the DOE 100 year depreciation model method for harvested wood products in use on the K tract, the resulting net revenue increases from $.83 per forested acre per year to $1.14 per forested acre per year, a 37% increase in net revenue. While this income level is still not very significant, you can see the impact of this policy development on the projects economic performance.

The Current Market Result:

The graph below shows the market price of carbon on the CCX platform since inception. As you can see, the price appreciation since inception is nearly 96%. When we completed the K tract analysis in August of 2006, the sale price of one MtCO2e on the CCX platform was $4.35. This is significantly more than the $.95 to $3.70 per MtCO2e used in the historic K tract economic analysis.



If we take the sequestration estimates from our K tract analysis and apply the current price of carbon for each year in the period, our net income estimates rise to nearly $4.70 per forested acre per year. If we then add in the ability to take credit for harvested wood products in use our net revenue rises to $5.92 per forested acre per year, or total net revenue just over $310,000 for the six year period. As you can see, market conditions and policy developments are creating an income opportunity for forest landowners that could be significant over time. It is at these levels of net revenue that we believe forest landowners will be interested in making the commitments and investments required to participate in carbon markets.

Summary:

The successful completion of the K tract analysis project revealed a number of important and interesting aspects about sustainably managed forests and the rapidly developing carbon markets. While the historical economic results weren't very impressive, the K tract test model did produce a positive financial result. This result is more encouraging when you consider the current price of carbon, which could result in revenue streams similar to those currently generated through recreational leases on forestland. The landowner's decision to participate in carbon programs will however, be heavily influenced by other factors such as commitment period, set-up costs, market access, inventory needs, and others. During this project we also learned that not all forests make good offset projects. Small, slower growing, and/or more aggressively harvested forests may not generate levels of carbon required to offset start-up and participation costs over the project lifespan.

While interviewing representatives from carbon markets and registries and by reading through volumes of carbon market rules and policies, it became readily evident that this business is in its infancy and is rapidly changing. Rule sets are rapidly developing in response to policy development and other influences. We also learned that not all markets and registries will recognize carbon from managed forests. The various viewpoints on additionality, assuredness, and permanence combined with outside political pressures will make the acceptance of offset credits from managed forests inconsistent at best. The general belief that a federal greenhouse gas program will happen in the coming years makes it imperative that the forestry community look to influence policy favorably in this regard.

No other form of carbon offset project can produce a volume of carbon credits to mitigate climate change with all of the other positive ancillary benefits that managed forests provide society. Clean water, biodiversity, esthetics, wood products, and recreation are just a few of the valuable co-benefits from forests that you will not find in agricultural sequestration projects, geologic sequestration, or methane gas capture. The potential for managed forests in this new ecosystem market is significant. New rule set developments such as the trend toward recognizing carbon stored in harvested wood products along with the rising prices for carbon credits are creating a significant investment and cash flow opportunity for some forest landowners. Forest landowners that are willing to produce credible, verifiable forestry offset projects from sustainably managed forests will likely have a strong influence on future policy in this area.

For more information on carbon sequestration, carbon markets, and forestry offset projects contact Matt Smith, CF, ACF, EMS-A, Director of Land Management, Forecon Inc. at msmith@foreconinc.com, or call (716) 664-5602, ext.313.

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