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Carbon Sequestration... What's That?

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There has been growing concern about the amount of carbon being emitted into the atmosphere, and the possible effect of those emissions on our climate. The amount of carbon dioxide (CO_2) in the atmosphere is rising, according to most sources, supposedly creating the global warming effect. Many observers have identified reducing fossil fuel emissions as the only solution to this global crisis, yet recent debate suggests this solution by itself is not economically feasible in time to make a difference.

Carbon is transferred to and from the earth's atmosphere in a continuous cycle. CO_2 and other gases that naturally occur in the atmosphere capture solar radiation and reflect it back to earth. This warms the surface of the earth and is referred to as the "greenhouse effect". Without this effect, our planet would be about 56 degrees F colder on average.

Carbon sequestration – essentially sponging up carbon dioxide emissions with trees and other plants – appears to be a simple, common sense approach to the climate crisis. The carbon cycle is the true cycle of life. Every life form we know is based on carbon. Carbon is stored via carbon sinks. A carbon sink is defined as a process or an activity that removes a greenhouse gas (CO_2) from the atmosphere. A carbon source is a process or activity that produces a greenhouse gas. Atmospheric concentrations of CO_2 can be lowered by either reducing emissions or by taking CO_2 out of the atmosphere and storing it in terrestrial, oceanic, or freshwater ecosystems. The fact that we have temporarily thrown the global carbon cycle out of balance suggests that we can also rebalance the system by improving vegetation management and natural sequestration of atmospheric carbon through photosynthesis. Obviously, the more trees and plants we have on earth, the more carbon sinks we have.

In 1992, nearly all countries in the world signed the United Nations Framework Convention on Climate Change (UNFCCC), establishing a long-term goal to stabilize atmospheric concentrations of greenhouse gases. Each party to the convention is committed to limiting greenhouse gas emissions and protecting and enhancing greenhouse gas sinks and reservoirs. In December of 1997, as part of efforts to fulfill the Convention, international negotiators signed the Kyoto Protocol in Japan. The protocol directs developed countries to reduce their emissions of CO_2 and five other prominent greenhouse gases by at least 5% below 1990 levels between 2008-2012. The US is committed to reductions of 7 percent and Canada to 6 percent.

To help achieve these targets, the Protocol allows developed nations to credit removals of greenhouse gas emissions by natural sinks that store carbon. Carbon is the primary component in greenhouse gases. Trees sequester carbon as they grow by removing it from the atmosphere, essentially becoming carbon pools (sinks). The carbon is stored in the dead wood, branches, roots, etc. Trees are important carbon sinks and can store more carbon than other vegetation types. Carbon forms about half the dry weight of a tree.

All land uses and vegetation management can help rebalance the carbon cycle (e.g. sequestering a ton of carbon for every ton added to the atmosphere by human activities). Adverse land uses and fossil fuel use release an estimated net 7.3 billion tons of carbon each year. Existing natural uptake in the oceans and on land adds up to approximately 4 billion tons per year - a difference of more than 3 billion tons.

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Recent discussions have centered on the need for methods to track, map, and calculate carbon emissions, and account for worldwide land use and management. Such a system would be the foundation of a market-based system for trading standardized, certified, and internationally recognized carbon sequestration credits. Much of the work to establish a trading system has been done. What remains is for agencies, industry, and institutions to agree to final protocols. Then governments must recognize these credit certification systems.

Carbon offset credits could initially be offered at wholesale levels for $6 per ton, of which $3 would go to the landowner/manager for production of the credit. Three dollars would go to certifying and monitoring the credit for its life span to ensure the carbon was actually being stored. Actual market price would be determined by supply and demand. For example, a typical acre of mature mixed conifer forest in the Pacific Northwest can store 1 to 4 tons of carbon annually. Under the credit system, a landowner could get $3 to $12 of income annually from each acre of forest for simply managing a healthy forest, other crop, or rangeland. Six dollars per ton is a legitimate incentive to US, and other developed countries, landowners and managers to produce certified carbon credits. It would also provide developing countries the ability to create a new industry to care for and profit from their lands, far beyond what was ever realized from mining their natural resources to depletion. For all countries, the credit system would provide incentives and profit down to the individual land user to promote long-term sustainable resources and communities worldwide.

While carbon is stored in wood as organic carbon, it is sold in the emissions market as CO_2 equivalents. The conversion between organic carbon and CO_2 is 1:3.67 (e.g. 333 tons of carbon becomes 1,222 tons of CO_2 equivalents). If we assume a current price of $1 per ton of CO_2 equivalent, that carbon has a value today of $1,222. The landowner has the option of selling the credits now or waiting to see sell the credits at some later date, say in 2008, the first year of the compliance period under the Kyoto Protocol. If we estimate that the price will rise to $8/ton CO_2 by that date, the same 1,222 tons would have a net present value of $5,282. Return to the landowner at that price would be $5,282 less the costs of implementing the carbon project. Several companies are already offering emissions reductions exchange services to a broad group of affected parties.

The Sierra Club has taken a position against carbon trading, saying, "it would eliminate any incentive for industrialized companies to develop innovative technologies or strategies to reduce greenhouse gas emissions. By allowing polluting corporations to plant trees so that they may continue to burn fossil fuels essentially transfers carbon stored deep in the earth into carbon dangling above its surface. Such deals allow polluters to add new net carbon to the atmosphere, making long-term climate worse."

Undoubtedly, there is still a great deal of uncertainty surrounding the whole issue of carbon credits. On top of this, the role of forestry in any future emissions reduction scheme is still being debated. Because of these uncertainties, undertaking carbon projects at this time implies the risk that the credits may not have the same value in the future. Forests play an important positive role in the global carbon cycle, and forest landowners may be able to benefit from the services their forests provide, just as they do other forest products.

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