A NATIONAL STRATEGIC CARBON RESERVE FOR AMERICA AND THE WORLD

The United States must move from a foot-dragger
to a leading advocate for smart climate change solutions
while simultaneously improving the health of our natural world and food systems for future generations.

We propose a ***National Strategic Carbon Reserve*** (NSCR) so that the United States of America becomes a climate management role model for the World. The Reserve will combine the best of American ecological and conservation thought and practice with classic American entrepreneurial practice, public-private market values, partnerships and incentives.

The concept of the Reserve is to invest in ecological systems – forests, wetlands, grasslands and the soils found in these systems and in agricultural lands – improving their capacity to do the work of sequestering and storing carbon. The Reserve incorporates the "lowest hanging fruit" to manage ecologically past, current and future Green House Gas (GHG) emissions**.**

Whether you believe the broad consensus in the scientific community that we are fast-approaching a tipping point where excess GHG concentrations will trip devastating environmental and economic consequences (IPCC, USEPA, etc), or whether, like NASA Chief Climatologist James Hansen recently proclaimed, "we already have passed that threshold and we must reduce GHG's even faster," the time to act is now.

Our proposal stems from the now common recognition that America and all of mankind face a CO2e-impelled climate crisis. The solution to climate change will be found in a combination of reducing current and future GHG emissions *while also* improving the carbon sequestration capacities of our ecosystems. The latter strategy can contribute significantly to reversing the trend of excessive atmospheric loading of GHG's that began with the onset of industrialization in the18th Century.

A fundamental change in the stewardship of our ecosystems – particularly in regards to land – is at the heart of this proposal. Land – meaning the soil and the flora that grow in it – is the medium through which humankind can sequester significant amounts of carbon and perhaps other GHG's as well. The creation in the US of a CO2e emissions trading market would be the centerpiece to a policy package that would allow aggressive land-based sequestration investments to earn sufficient economic returns. Such policies will provide landowners with the necessary incentives to adjust their land management practices.

The reserve creates a global model of carbon management tied to land protection, restoration and management. Besides the carbon stored in the underlying limestone rock, and dissolved in the oceans, the third largest storage location for carbon on the earth is in our soils. Yet current land management practices are counter-productive to the national commitment to reduce our collective impact on the climate change crisis. According to the USDA, soils in the US on average have lost 37-50% of their soil organic matter and carbon (USDA web site; Kimble et al 2007) by soil erosion, poor tillage practices and excessive nitrogen fertilizer applications. Even the use of anhydrous fertilizer applications to bolster agricultural production has directly resulted in reduced levels of soil carbon in hundreds of millions of acres of our farmlands – essentially through an oxidation and "composting process" where nitrogen fuels the decomposition of organic matter. The consequences go beyond reduced carbon sequestration capacities, extending to Gulf Hypoxia, floods, and a deterioration of the water quality in our national waterways and oceans.

The positive flipside to these discouraging facts is that soils restored to pre-industrial agriculture conditions have a carbon sequestration capacity that can be greater than their current, health-depleted conditions. Thus protection of uncorrupted soils and a carbon-centric management approach to protected and restored ecosystems in general can be the linchpins to a broad ecosystem carbon sequestration approach to the climate change crisis. In the period 2000 to 2005, 53% of existing anthropogenic GHG emissions were mitigated through storage in the surface soils and vegetation systems on our planet. The United States has the capacity to sink 100% of its own emissions in its terrestrial vegetation and soils systems (Lal 2007; Kimble et al 2007).

And in addition to the carbon-related benefits, it so happens that numerous other benefits come out of the different approach to land and overall ecosystem management that this proposal recommends, such as improved water quality and soil fertility and farm-level and community-level economic benefits. These benefits are noted in a subsequent section.

To realize this potential, we propose the following three core National Strategic Carbon Reserve (NSCR) programs**:**

- National Ecosystem Restoration and Conservation Land Program (NERCLP)
- National Sustainable Agricultural Standards Land Program (NSASLP)
- Sustainable Urban Agricultural Local Food Land Program (SUALGLP)

National Ecosystem Restoration and Conservation Land Program (NERCLP)

The NERCLP is a land use and land management program that will complement the planned 30 to 50 year cap and trade strategies currently being contemplated. This program can be implemented at a fraction of the cost of emission reduction-oriented programs. The NERCLP requires no new technology – only smarter, carbon-centric land management. We can achieve massive sequestration levels with what we know and have now! All that is missing for success are 1) rock solid policy directions that create effective and efficient market incentives, and 2) consensus on the measurement systems to document and track success.

This NERCLP program can be successfully implemented at an average cost of several thousand dollars per acre. These conversion costs can be partly recovered over time through the sale of carbon credits as the carbon accrues in soils and vegetation on the land. Other economic benefits of the conversion can accrue in the form of higher yields – especially in drought years, price premiums paid by consumers for sustainably grown crops, and avoided production costs on such items as fertilizer and pesticides. Adjusting national level incentive payments policies to align them with a carbon-centric approach to land management will augment and accelerate land conversion efforts.

A statement above claimed that the US could sequester the equivalent of 100% of its emissions in land and vegetation. Exploring this claim in some economic detail, let us estimate the carbon impacts of converting 500 million acres of farmland that is now managed with industrial agricultural practices (in 2002, there were ~938 million acres of US farmland). At a rate of 50 million acres a year, the major cost elements of this program may be achievable for $100 billion dollars a year for 10 years. With a potential for average carbon accrual in Midwestern US soils being equal to 1.18 metric tons of CO2 captured per acre per year (using the 30-50 year average carbon accrual rate found in Illinois prairie restorations), by 2030 the US will have provided significant atmospheric carbon reductions amounting to 11.85 billion tons of CO2. Assuming a carbon credit value of $30/ton, the conversion would bring ~$355.5 billion to

these landowners over 20 years, thus providing a significant portion of the funding needed to make the transition. (Note that these calculations do not include avoided costs and emissions from a ~75% (?) reduction in the use of carbon emissions-intensive inputs such as fertilizer.)

Converting Carbon Capture Potential of Soil to CO2 Capture		
meteres/acre		4,046.86
grams of carbon captured per meter per year		80
grams of carbon captured per acre per year		323,749
metric tons of carbon captured per acre per year		0.32
ratio of carbon dioxide weight to to carbon		3.66
metric tons of CO2 captured per acre per year		1.18
measurement period (years)		20.00
metric tons of CO2 captured/acre over measurement period		23.70
assumed carbon credit value of one ton of captured CO2	$	30.00
value of one acre's captured CO2 in one year	$	35.55
value of one acre's captured CO2 over measurement period	$	710.95
number of acres converted		500,000,000
metric tons of CO2 captured in one year		592,459,780
metric tons of CO2 captured over measurement period		11,849,195,605
carbon credit value of one year for 500MM acre program	$	17,773,793,407
carbon credit value of 500MM acre program over 20 years	$	355,475,868,144

The restoration of other ecosystems and implementation of sustainable agriculture, including sustainable forestry, provide additional environmental and economic benefits and can increase the quantity of GHG's sequestered and stored in soils, forest trees, wetlands and other settings.

The NERCLP will include all protected public (e.g. national parks, grasslands and forests, national monuments, etc) and private lands (e.g. protected in conservation easements, nature preserves, prime agricultural lands, etc), special overlay protection zones (e.g. watershed and water supply protection lands) and existing USDA conservation and wetland reserve program lands, where as much as 45 million acres of set-aside land has had a documented profound climate change management benefit. Unfortunately, much of the land in the CRP and some WRP land is currently being converted back to agricultural production for corn-based ethanol where GHG benefits of the set aside are being reduced or eliminated (e.g. water source protection zones).

With a smart, national-in-scale, ecosystem service planning process (e.g. see the Milwaukee MMSD Conservation Plan, Kansas City Natural Resource Inventory Program and the Great Lakes Conservation Plan), all unprotected lands currently providing important GHG management and sink services, and all disturbed lands that could be ecologically restored to provide these services would be identified and mapped. The mapping would help draw the visual connections among such lands within watersheds and other important landscape-scale linkages to capture land cover/vegetation and other important locational criteria. This evaluation will include all urban and suburban areas, note their various weather regimes and heat island spots, and the opportunities for mitigating bioclimatic stress and increasing land and building values through re-vegetation. Using this process, an ecosystems services-centered economic valuation mapping of the entire USA needs to be prepared. This exercise would provide a defensible rationale for which lands should be protected and restored, and also the baseline data for a payment structure to landowners based on the valuation of the ecosystems services the land provides now and can provide once restored or being used for sustainable agricultural purposes.

The NERCLP program could provide a variety of funding options, such as for the purchase of conservation easements to protect and enhance GHG sinks. Or to incentivize landowner participation in land protection and restoration. Perhaps a double-path payment

scheme, one if the land is perpetually protected with easements, would leverage the greatest public participation. Incentives can include the successful annual payment model of USDA such as that used in the Conservation Reserve Program, whereby a national average of ~ $45 per acre has been paid annually to participating farmland owners over a 10-15 year contract period to place their land in deferred crop production and conservation cover plantings. Alternatively, it may be possible to permanently buy down the value of a conservation easement to perpetually protect the carbon stocks on land for 50-80% of the appraised value of that land or through donation and preferential tax credits. This strategy is being successfully accomplished by the land trust movement throughout the US at this time with willing landowners interested in conservation. If this program were expanded to involve all owners with lands having potential GHG climate management benefits, the landowner reception to such a program could be very positive. There will be special zones added within urban/suburban areas that may require higher restoration costs. Yet these zones will also yield great benefits beyond CO2 capture, such as amenity improvements, hazard protections, and climate modification for human comfort so critical for the inner city.

The NERCLP can also help employ thousands of Americans through a re-training and back to work program to restore conservation lands included in the National Strategic Carbon Reserve. People will be offered rewarding careers as ***Earth Carbon Land Stewards*** with technical and hands-on skills. This is a proposed future version of the very successful and nationally invigorating civilian conservation corps program from the 1930's.

While Federal funds will manage the NSCR, within a cap and trade market environment there also is a broader market for carbon and other environmental service credits. Using the national environmental services and valuation mapping of existing and restored levels of carbon sinks, private land owners will be able to sell the value of the environmental services on their lands, especially GHG management functions, with the guarantee of long term conservation easements, and external follow-up monitoring and validation.

National Sustainable Agricultural Standards Land Program (NSASLP)

The NSASLP is envisioned to be an incentive-based, voluntary initiative where participants can sell the value of the improvements in soil carbon on the open market, but only if they join the ***National Sustainable Agriculture Registry***. Draft standards for this sustainable agricultural lands program are currently going through the American National Standards Institute (ANSI) where the agricultural and conservation industries are working to craft acceptable standards. NSASLP is envisioned to be a national registry of private landowners who adopt the sustainable agriculture standards that might be administered by USDA, NRCS and the Farm Services Agency (FSA) through their existing farm programs. The goals of this program are simple:

1. Grow Healthy Soils – rebuild soil carbon and organic matter levels in our nation's agricultural production and livestock grazing soils.
2. Grow Healthy Food – improve nutrition for our nation as the result of an improved soil system.
3. Grow Healthy Water – reduce storm water runoff, increase infiltration and replenish declining potable water supplies in the ground, and reduce erosion and sedimentation (and associated damage and management costs) in our nations waterways.

Sustainable Urban Agricultural Local Food Land Program (SUALFLP)

The politics and economics of food are too closely tied to energy (and therefore GHG emissions) and must be de-coupled. The agriculture sector generates about as much GHG emissions annually (through livestock, fertilizer, tillage, soil erosion, flooding, and food transport) as the entire transportation sector in the US. One first step in de-coupling food and energy is to support the growth of farms growing food for local consumption. An additional step is to ensure that those farms are using sustainable farming practices, which include dramatic reductions in the carbon intensity of the inputs (like fertilizer). The SUALFLP program has four simple objectives, all of which can be reached through an increase in the acreage of farms near cities using sustainable farming practices. These objectives are:

1. Grow More Food Locally – for local consumption.
2. Reduce GHG Emissions – by reducing energy needed for food cultivation, transportation, and processing.
3. Promote Local Food Security – give food production and distribution *a national standing* and increase access to local land, markets and farmer training.
4. Optimize the Soil's Carbon Holding Capacity – by utilizing practices that improve soil quality.

The SUALFLP program aims to localize healthy, sustainably-produced food systems in all urban regions and cities of greater then 100,000 persons in the US. The goal will be to identify the most productive prime agricultural lands in the country's urban peripheries, ensure their perpetual protection, and then incentivize existing farmers and incubate new urban farmers who will own, lease, or operate this urban agricultural land program. On this land, we envision 5,000-10,000 acres of land becoming part of the SUALFLP program for every urban farming area, where these lands are protected, soils improved, and farms focused exclusively on their local markets.

The UALGLP program needs local government zoning restrictions and various levels of financial incentives to be successful. Because of the high values of urban agricultural lands if such lands may be converted to higher income producing uses, farmers are being taxed out of their land and/or selling that land to a residential or commercial developer. The country needs a *critical urban agricultural lands preservation incentives and funding program* where these important agricultural lands are protected now, and don't fall forever out of farming use.

The SUALFLP program is envisioned to include a major retraining fund for incubating urban farmers. Successful example programs such as the Intervale Center (Burlington, VT) and Prairie Crossing (Grayslake, IL) may serve as national models for creating, financing, and governing local farm-based food production and distribution systems that also grow healthy soils and reduce and sequester GHG emissions.

Summary

We propose an aggressive roll out of the **National Strategic Carbon Reserve** and its supporting programs. The first steps will 1) be the formation and funding of private and public partnerships that will develop national ecosystem services maps and orchestrate policy alignments, and 2) identification and implementation of near-term conversion projects.

Regarding 1), These partnerships will include teaming with the Departments of Interior, Commerce, NOAA, Agriculture, Treasury, EPA and Defense, and cooperating universities and colleges to develop management guidelines, practices, and funding plans for the different environments [climates?] found in the US. Primary areas of federal government policy intervention could include financial incentives for private land owner participation, establishing

the policy framework to support voluntary and mandated federal, state, and local agency supporting roles, and funding for overall program administration.

For efficiency purposes, we believe that the governmental programs should serve a supporting role, encouraging the development of the private marketplace. The private marketplace is years ahead of governmental programs in testing the ecosystem services market, developing incentives, and developing projects that are working well on the ground. A supporting federal government role would be essential to accelerating achievement of the the National Strategic Carbon Reserve's goals.

The whole will go as a package to ***President Obama*** as selected executive orders and proposed legislation. We expect that within two years the three programs that make up the National Strategic Carbon Reserve Program will be operationally functional and initial demonstration projects implemented. We also propose that existing private marketplace programs that can serve as national models be used to scale up these programs nationally and quickly!

Program Summary, Additional Benefits, and Open Questions for Research————

Program Summary: A fundamental change in our national and personal perspectives on land will occur under this program. Land will be viewed and encouraged as a primary medium through which humankind can sequester carbon. While CO2e emissions reduction technologies are being researched and deployed, we citizens will not sit around waiting for those innovations. Instead each landowner and land management agency will have incentives in place (and disincentives removed) to restore, protect and manage healthy ecosystems and healthy soils.

If the program can successfully and progressively incorporate the acreages identified above, a cost of $300 billion dollars over 30 years (depending on payment and purchase strategy, the passage of a carbon cap and trade system, and the market value of carbon credits), if it is fundamentally incentives and market driven, land purchases and carbon payments after the initial governmental payments to participants are made, can in part be from private monies needing carbon credits.

Additional NSCR Benefits:

- Environmental
  - improved local air quality
  - improved soil and water quality,
  - enhanced wildlife habitat
  - cleaner air quality
  - reduced soil erosion
  - decreased waterway management costs due to sedimentation,
  - increased quality and reliability of potable water supplies recharged into ground water and in surface water bodies,
- Economic
  - Increased self-sufficiency of local economies, enhanced by reduced export of community wealth to food chain middle-men
  - Reduced farmer exposure to volatility in energy prices
  - Reduced national energy imports from reduced use
  - Reduced dependence on energy imports from increased bio-mass available for energy uses
  - Creation of farm jobs and ecosystem restoration jobs

The following paragraphs expand upon some of these benefits.

Growing appropriate perennial biofuel and using some lands for other energy demand purposes (e.g. biofuel, geothermal, biomass production, etc) provides yet another link to national and global benefits from this program.

Sustainable food production also grows carbon and healthy soils on the same land, and many of the above benefits. Improved food quality, human health, and enhanced environmental quality are additional benefits of sustainable farms and soils.

Urban food production commitments reduce the dependence of urban areas on food shipments from afar, reducing transportation-generated GHG emissions and helping to insulate consumers from spikes in energy prices that become reflected in food prices. Emphasis upon local food production also creates local employment and protects important agricultural lands around each metropolitan area.

The program would primarily fund land protection, its restoration, and perpetual maintenance, along with enumeration and validation of GHG benefits on the land. Money would go to private landowners to incentivize their participation. Businesses and others wanting carbon and other GHG emission credits will have access to the National Conservation Reserve carbon credits—which is the pooled carbon credits generated from all private and public lands included in the Reserve. Thus, private dollars can be used to fund elements of this program.

Investing now and quickly in this "low hanging fruit" will hedge current costs of addressing climate change against future costs of delays and costly strategies and programs. Investing now also hedges against what will certainly become increasingly expensive and risky strategies as climate tipping points become evident and begin to impact the national and global economy, and people and their health, safety and livelihoods. A dollar spent now will likely provide many multiple benefits, including saving significant future dollars.

Open Research Questions:

- Estimating the full economic costs and benefits of the NSCR programs
- Identifying, quantifying, and developing remedies for any negative unintended consequences, such as the negative economic impacts on those whose livelihoods depend on the current food production and distribution system's current supply chain.
- Estimating the program's administrative costs
- Identifying the appropriate governmental level of intervention (local, state, and national) and developing a coherent, integrated, and properly sequenced package of policy changes.

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