

ENVIRONMENTAL IMPLICATIONS OF CARBON  
CAP AND TRADE

**Presentation to**

**LSU AgCenter  
Carbon Credit Conference**

**By**

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**May 14, 2008**



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ENERGY STUDIES

# ENVIRONMENTAL IMPLICATIONS OF CARBON CAP AND TRADE

## **Presentation Outline**

- Background
- Current Status of Carbon Markets
- U.S. Federal Regulation of GHG
- Agriculture-Related Offset Projects
- Environmental Benefits of Agriculture-Related Offset Projects
- Added Value through Project Synergy
- Conclusions
- Questions

# ENVIRONMENTAL IMPLICATIONS OF CARBON CAP AND TRADE

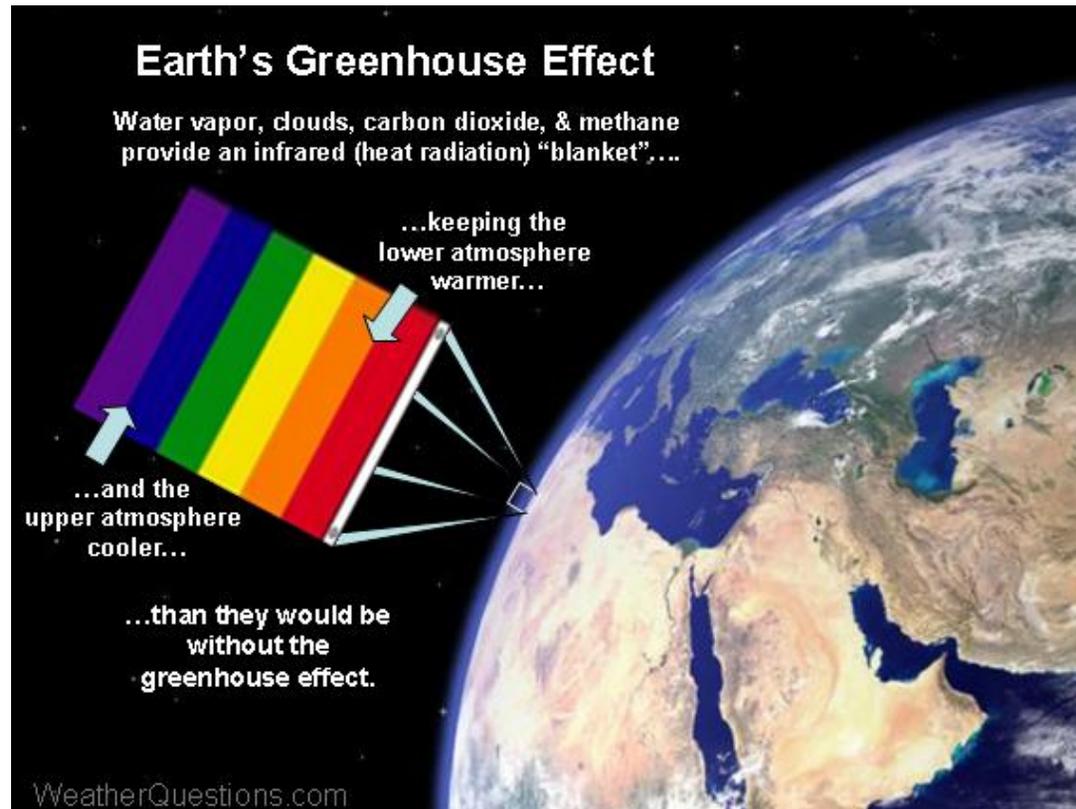
## Background

- GHG Gases and Global Warming
- Mitigation Measures
- Capture and Storage (sequestration) of CO<sub>2</sub>
- Cap-and-Trade



# Background

## GHG Gases and Global Warming

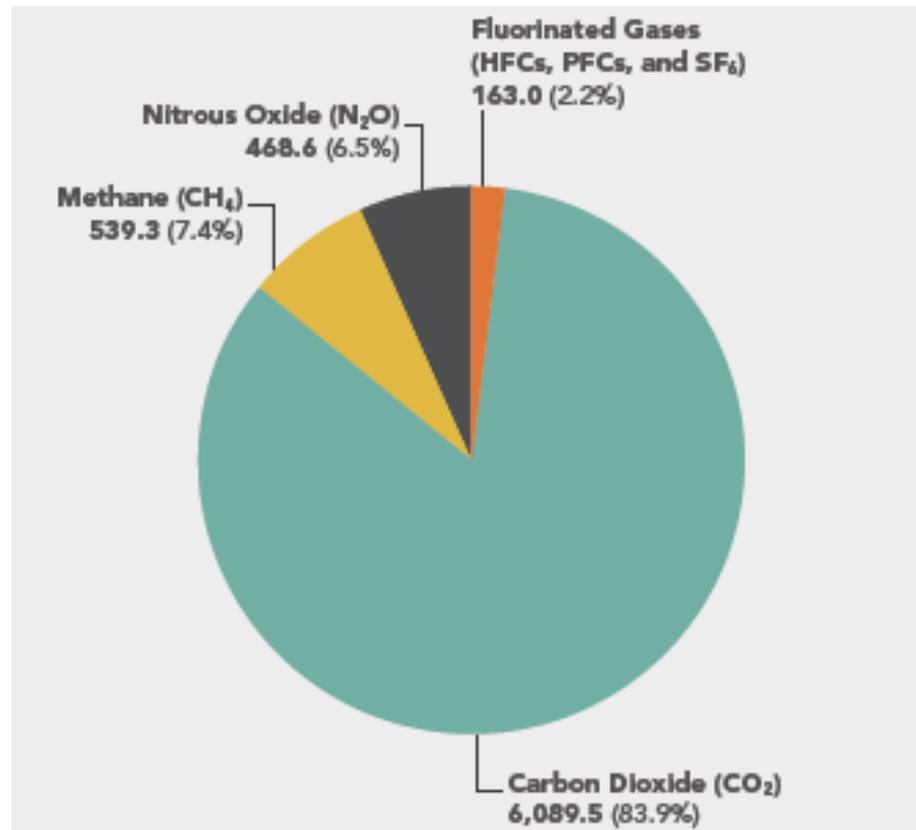


The most powerful greenhouse gases based on greenhouse effect are: water vapor (36-70%), carbon dioxide (9-26%), methane (4-9%), and ozone (3-7%).

Six internationally-recognized (IPCC) greenhouse gases are: carbon dioxide ( $\text{CO}_2$ ), methane ( $\text{CH}_4$ ), nitrous oxide ( $\text{N}_2\text{O}$ ), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride ( $\text{SF}_6$ ).

# Background

2005 U.S. GHG Emissions:  
7,260.4 MMTCO<sub>2</sub>e



Source: Resources for the Future

# ENVIRONMENTAL IMPLICATIONS OF CARBON CAP AND TRADE

## Background

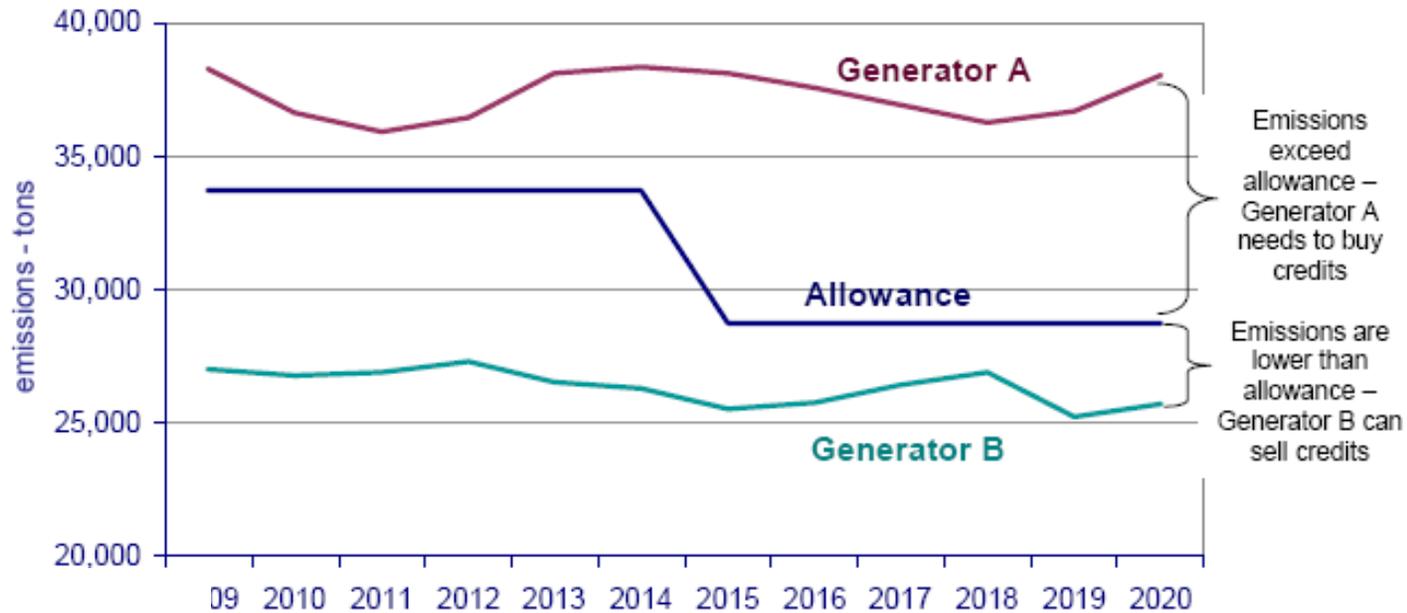
### Mitigation Measures

- Control/reduce greenhouse gas (GHG) emissions
- Use alternative low-carbon/renewable energy sources
- Reduce deforestation
- Employ energy conservation and efficiency measures
- Capture and storage (sequestration) of CO<sub>2</sub>

# ENVIRONMENTAL IMPLICATIONS OF CARBON CAP AND TRADE

## Background

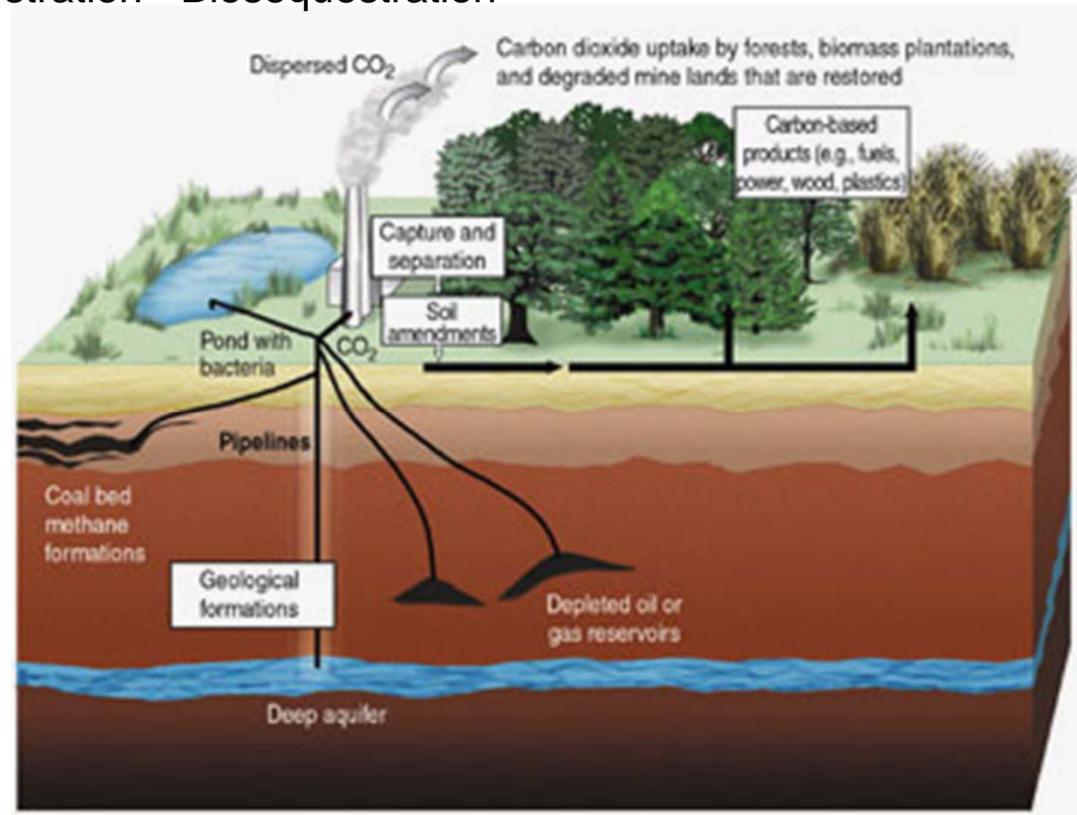
### Cap – and – Trade Basics



# ENVIRONMENTAL IMPLICATIONS OF CARBON CAP AND TRADE

## Background

### Carbon Capture and Storage Geosequestration - Biosequestration



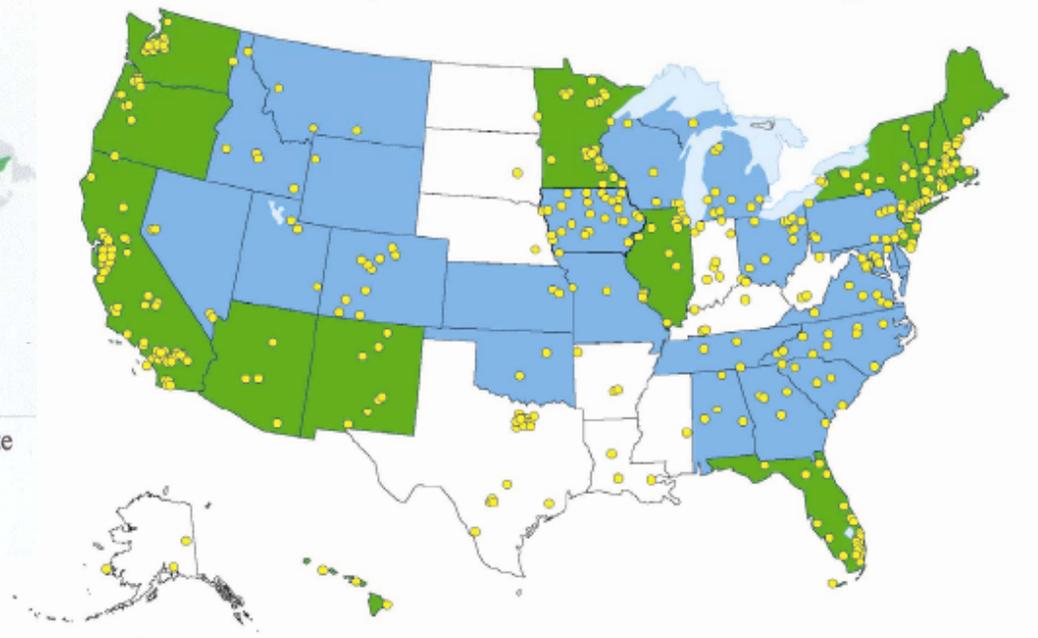
Source: [www.123eng.com/projects/carbon.doc](http://www.123eng.com/projects/carbon.doc)

# U.S. Voluntary Climate Change Initiatives



The Western Regional Climate Action Initiative.  
Members  
Observers

State and Local Participation in Selected Climate Change Initiatives



- States with Greenhouse Gas Emission Targets and Participating in the Climate Registry (17)
- States Participating in the Climate Registry without a Greenhouse Gas Emissions Target (22)
- Cities Participating in the U.S. Mayors' Climate Protection Agreement (780)



RGGI

<sup>11</sup> Information in this figure was taken from the Climate Registry, the Pew Center on Climate Change, and the US Conference of Mayors.

# Current Status of Carbon Markets

## Voluntary

- Informal (negotiated offset values)

- Formal (tracked market values, e.g. CCX)

## Mandatory (global/federal/regional cap-and-trade programs)

- UN Kyoto Protocol

- EU ETS

- CANADA - Turning the Corner Program – currently drafting regulations

- RGGI/WCI – RGGI expected to initiate program Jan1,2009

- U.S. federal cap-and trade program?

## Current Market Uncertainties

- Timing/features of potential federal program

- Federal preemption

- Assigned vs. auctioned allowances

- Amount of domestic and international offsets allowed

- Offset values (i.e. voluntary versus mandatory)

- Protocols (valuation, validation, verification)

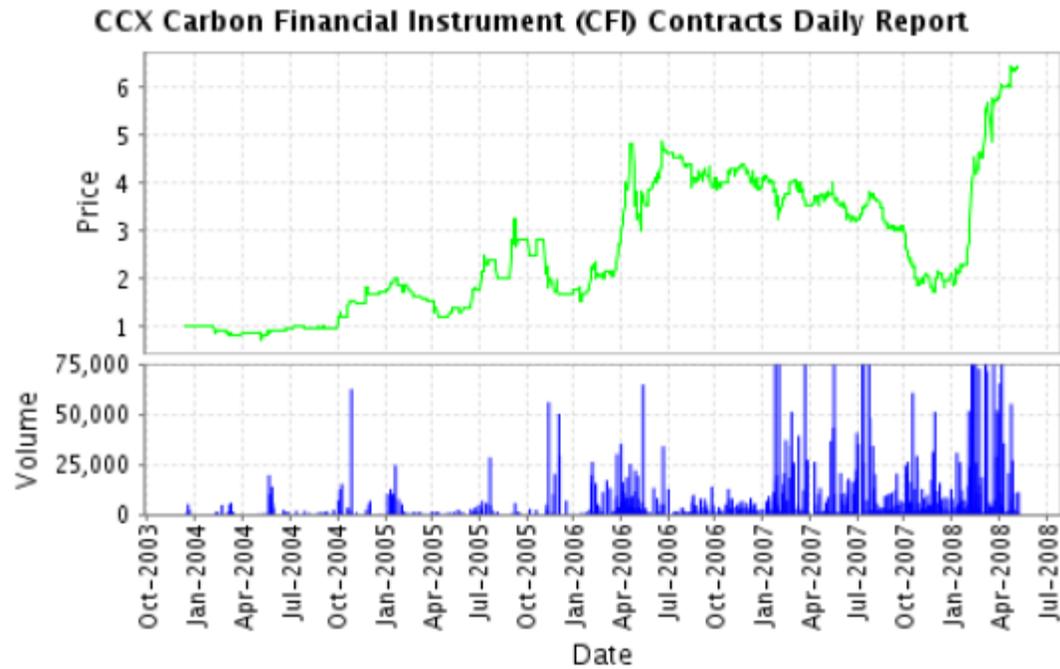
# Informal Voluntary Carbon Offsets Market

<b>Ecobusinesslinks.com Carbon Offset Survey</b>						
<small>(Prices are for individuals, businesses may be able to get volume discounts)</small>						
<a href="#">Share This</a>						
Carbon Offset Provider	Price (US\$/Metric ton CO2)	Non-profit	Projects Types	Project Choice	Offset Types	Product Certification/ Verification*
<a href="#">AtmosClear Climate Club USA</a>	\$3.98 <sup>a</sup> - \$25.00	No	Methane	No	Car, Home	Environmental Resources Trust
<a href="#">Carbonfund.org USA</a>	\$4.30 <sup>b</sup> - 5.50	Yes	Renewables, Efficiency, Reforestation	Yes	Home, Car, Air, Events, Business	Environmental Resources Trust, Climate Community and Biodiversity Standards, Chicago Climate Exchange, UNFCCC JI
<a href="#">e-BlueHorizons USA</a>	\$5.00	No	Renewables, Reforestation	No	Home, Car, Air	Chicago Climate Exchange, Environmental Resources Trust
<a href="#">Eco2Pass USA</a>	\$5.62-8.25	No	Projects from Chicago Climate Exchange	No	Car, Home, Personal, Family	Chicago Climate Exchange
<a href="#">DriveNeutral.org USA</a>	\$6.93 & up	Yes	Efficiency	No	Car	Chicago Climate Exchange
<a href="#">DrivingGreen Ireland</a>	\$8.00	No	Renewables	No	Car, Air, Events	SES
<a href="#">Terrapass USA</a>	\$10.91	No	Renewables, Methane	No	Car, Home, Air, Events, Business	Chicago Climate Exchange, Center for Resource Solutions, Gold Standard, Voluntary Carbon Standard
<a href="#">The CarbonNeutral Company UK</a>	\$12.64 (USA) £7.50 (UK VAT incl.)	No	Renewables, Efficiency, Reforestation, Methane	Yes	Car, Air, Events, Business, Deliveries, + many others	CDM Gold Standard, Edinburgh Centre for Carbon Management, Independent Advisory Committee, UNFCCC JI, PricewaterhouseCoopers
<a href="#">Standard Carbon USA</a>	\$15.00	No	Methane, Efficiency, Renewables, Carbon Sequestration	No	Car, Air, Sea, Events, Political Campaigns	Chicago Climate Exchange
<a href="#">Cleaner Climate UK &amp; Australia</a>	\$15.00-18.00	No	Renewables, Efficiency	No	Air, Car, Home, Business	CDM Gold Standard



# Formal Voluntary Carbon Offsets Market

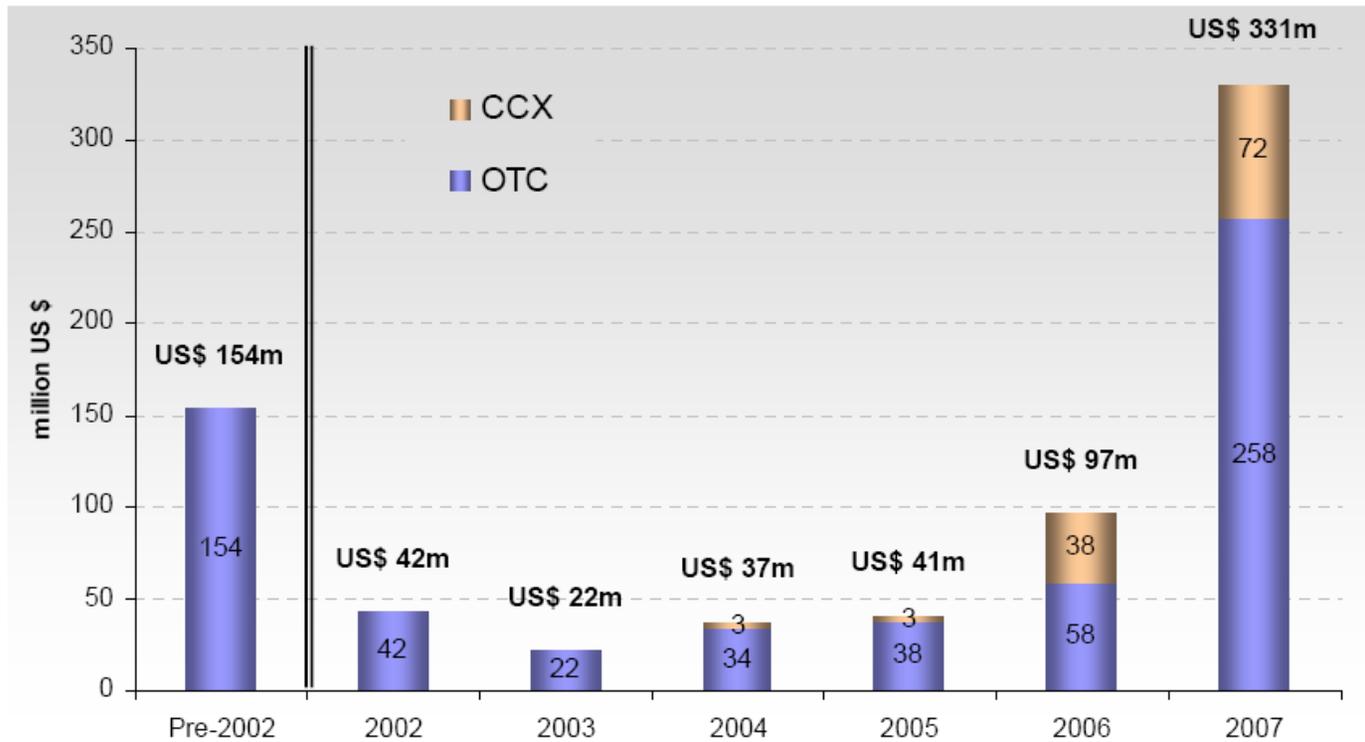
## Chicago Climate Exchange



Price and volume reported in metric tons CO<sub>2</sub>

# U.S. Voluntary Carbon Offsets Market

*Transaction Values on the Voluntary Carbon Market <sup>2</sup>*



Source: Ecosystem Marketplace, New Carbon Finance

# Outlook for Federal Regulation of GHG Bills Before Congress

As of March 2008, lawmakers had introduced more than 195 bills, resolutions, and amendments specifically addressing global climate change and greenhouse gas emissions. Some of the more notable are:

- **Lieberman-Warner Climate Security Act of 2008 (S. 2191)**
- **Bingaman-Specter Low Carbon Economy Act (S. 1766)**
- **McCain-Lieberman Climate Stewardship and Innovation Act (S. 280)**
- **Sanders-Boxer Global Warming Pollution Reduction Act (S. 309)**
- **Kerry-Snowe Global Warming Reduction Act (S. 485)**

Each of these bills proposes economy-wide cap-and-trade regulatory programs for reducing U.S. greenhouse gas emissions (principally carbon dioxide –CO<sub>2</sub>). Proposed emissions reductions range from around 60 to 70 percent of 1990 or 2005 levels by 2050 following different temporal reduction tracks.

General comparisons of these bills are provided on the Pew Center on Climate Change and the Resources for the Future web sites.

Of the bills described above, S. 2191 has progressed the furthest having passed out of committee to the Senate floor. It is scheduled to be heard in full senate in June.

It has also been reported that Representative John Dingell, Chairman of the House Energy and Commerce Committee, plans to release one or more draft global warming bills in the near future. Additionally, Senator George Voinovich is floating an alternative to Lieberman-Warner.



# Outlook for Federal Regulation of GHG

## Positions of Presidential Candidates:

\* All three candidates are on record supporting cap-and-trade programs for GHG emissions reductions

### Senator Barak Obama

- Favors cap-and-trade program to reduce GHG
- Cut greenhouse gas emissions by 80 percent from 1990 levels by 2050; reduce emissions to 1990 levels by 2020
- Require fuel suppliers to cut carbon content by 10 percent by 2020.

### Senator Hillary Clinton

- Supports a cap-and-trade program that auctions 100 percent of permits
- Wants to cut greenhouse gas emissions by 80 percent from 1990 levels by 2050
- Require all publicly traded U.S. companies to file report on climate change risks with the Securities and Exchange Commission

### Senator John McCain

- CoSponsored McCain –Lieberman S.280 (60 percent reduction from 1990 levels by 2050)
- Recent campaign media statements related to climate change. Return GHG emissions to 2005 levels by 2012, to 1990 levels by 2020, to 22 percent below 1990 levels by 2030, and to 60 percent below 1990 levels by 2050
- Appears supportive of Lieberman-Warner with additional support for nuclear energy

## Side-by-side Presentation of Low Carbon Economy Act (S. 1766) & Lieberman-Warner Climate Security Act (S. 2191)

	<b>Bingaman/Specter (S. 1766)</b>	<b>Lieberman/Warner (S. 2191)</b>
<b>Scope</b>	Economy wide, 6GHGs 86% of GHG emissions	Economy wide, 6GHGs 84% of GHG emissions
<b>Cap in 2012</b>	6,652 MtCO <sub>2</sub> e (8% above 2005)	5,775 MtCO <sub>2</sub> e (4% below 2005)
<b>Cap in 2020</b>	6,188 MtCO <sub>2</sub> e (~2005)	4,924 MtCO <sub>2</sub> e (18% below 2005)
<b>Cap in 2030</b>	4,819 MtCO <sub>2</sub> e (22% below 2005)	3,860 MtCO <sub>2</sub> e (36% below 2005)
<b>Cap in 2050</b>	4,819 MtCO <sub>2</sub> e (22% below 2005)	2,796 MtCO <sub>2</sub> e (71% below 2005)
<b>Allowance allocation and auctioning</b>	Some sectoral allocation specified, such as industry (53% in 2012 declining to 25% in 2030) or agriculture (5%).  Increasing auctioning for remainder: 24% in 2012 to 32% in 2020 and 53% in 2030  Auction proceeds funneled into tech fund	Some sectoral allocation specified, such as industry (43% in 2012 declining to 7% in 2030) or agriculture&forestry (5%).  Increasing auctioning for remainder: 28% in 2012 to 71% in 2031 thru 2050  Auction proceeds funneled into 7 funds in US Treasury, for technology development
<b>Offsets</b> 	Unlimited use of domestic offsets 10% for int'l offsets (subject to President's decision)	15% for domestic offsets 15% for int'l <u>allowances</u>
<b>Banking</b>	Unlimited	Unlimited
<b>Borrowing</b>	No borrowing	Limited to 15% (not from periods more than 5 years ahead, interests accrue)
<b>Other cost control</b>	Safety valve: US\$12 per tCO <sub>2</sub> e (+5% p. a. above CPI) Payment funneled to tech fund	Carbon Market Efficiency Board to monitor economic and env't'l effectiveness of C-mkt and implement cost relief measures such as less restrictive conditions on borrowing
<b>Early action</b>	1% of allowances, from 2012 to 2020	5% of allowances for early action in 2010, declining to 0% in 2017
<b>Other provisions</b>	Bonus allocations for carbon capture and storage Funds and incentives for technology R&D  Target subject to 5-year review of new science and actions by other nations	Bonus allocations for carbon capture and storage Funds and incentives for technology, adaptation, & mitigating effects on poor Cap-and-trade system performance and targets subject to 3-year NAS review

Source: Natsource & Pew Centre on Global Climate Change

# Agriculture-Related Offset Projects

## CCX Offsets Program Projects

- Agricultural methane
- Agricultural soil carbon
  - conservation tillage
  - grass planting
- Rangeland soil carbon management
- Forestry
  - afforestation
  - long-lived wood
  - managed forest projects
  - urban tree planting

# Agriculture-Related Offset Projects

## S. 2191 Sec. 2403 Offsets Program Projects

### 1. Agricultural and Rangeland Sequestration and Management Practices

- Altered tillage practices
- Winter cover cropping, continuous cropping and other means to increase biomass returned to the soil in lieu of planting followed by fallowing
- Conversion of cropland to rangeland or grassland, on the condition that the land has been in nonforest use for at least 10 years
- Reduction of nitrogen fertilizer use or increase in nitrogen use efficiency
- Reduction in the frequency and duration of flooding of rice paddies
- Reduction in carbon emissions from organic soils

# Agriculture-Related Offset Projects

S. 2191 Sec. 2403 Offsets Program Projects, Cont.

## 2. Changes In Carbon Stocks Attributed to Land Use Change and Forestry Activities

- Afforestation or reforestation of acreage not forested
- Forest management resulting in an increase in forest stand volume

## 3. Manure Management and disposal

- Waste aeration
- Methane capture and combustion

## 4. Any Other Terrestrial Offset Practices Identified by the Administrator

# Environmental Benefits of Agriculture-Related Carbon Offset Projects

## Carbon Capture and Storage (Biosequestration)

Under current conditions, *US agricultural soils and forests sequester about 700 million tonnes (metric tons) of CO<sub>2</sub> equivalent per year* (EPA, 2004), over 90% of which is from forest carbon sequestration. Although this amount alone offsets about one tenth of national GHG emissions, various actions can be taken to enhance sequestration above these baseline levels.

Estimates of the *biophysical carbon sequestration potential from changing management practices on the nation's cropland alone range from 300 to 550 million tonnes of CO<sub>2</sub> equivalent per year* (Paustian et al., 2001). *That is equal to the amount of CO<sub>2</sub> emitted annually by about 25-45 million cars.*

There is also ample *potential to enhance carbon sequestration through afforestation, which can store up to 5-10 tonnes CO<sub>2</sub> per acre per year over a timber rotation (20-50 years in the most productive forests of the Southern and Pacific Northwestern United States). Given the amount of land available for conversion from agriculture to forest, this could amount to tens or hundreds of millions of tonnes CO<sub>2</sub> of additional annual carbon sequestration.* Moreover, long-term storage of carbon in harvested wood products is possible for several decades at least, though not all accounting frameworks would necessarily include this as a creditable form of sequestration (e.g., Kyoto).

*U.S. agriculture and forestry together have a rather sizeable potential to mitigate the buildup of greenhouse gases. The highest estimates, in the range of 3 billion tons of CO<sub>2</sub> equivalent per year, would offset approximately 40% of all US GHG emissions – an amount larger than the GHG contribution of all motor vehicles in the U.S.*

Source: Murray – Overview of Agricultural and Forestry GHG Offsets on the US Landscape. Choices, 3<sup>rd</sup> Quarter 2004.



# Environmental Benefits of Agriculture-Related Carbon Offset Projects

## Environmental Co-benefits:

- Expansion/enhancement of wildlife habitat
- Water quality improvements
- Establishment/enhancement of wildlife corridors
- Improved protection for rare, threatened, endangered species
- Opportunity for enhancement of biodiversity
- Watershed protection and flood mitigation
- Soil conservation and erosion control
- Coastal protection and restoration
- Landscape esthetics

# Environmental Benefits of Agriculture-Related Carbon Offset Projects

**Agriculture-Related Carbon Offset Projects Are Icing on the Cake**  
Augmenting Other Louisiana Conservation Programs Including but not Limited to:

- National Resources Conservation Service  
CRP, EQIP, WRP, WHIP, CREP, CSP, GLCI
- Louisiana Soil and Water Conservation Districts
- Resource Conservation and Development Councils
- Coastal Wetlands Planning Protection and Restoration Act (CWPPRA)
- LDEQ/LSU Ag Center non-point source water quality program
- LDEQ Louisiana Clean Waters Program
- LDEQ TMDL Program
- LDAF natural resources conservation efforts
- LSU Ag Center Master Farmers Program
- LDWF natural resources conservation efforts
- LDNR Atchafalaya Basin Program
- NGOs (e.g. Nature Conservancy, Black Bear Conservation Committee, Ducks Unlimited)
- Conservation research projects by Louisiana colleges and universities



# Added Value Through Project Synergy



## The Tensas River Basin Project



### Helping Wildlife and the Climate

This tract located in Louisiana's Tensas (pronounced Tensaw) River Basin, is **the first offering in The Nature Conservancy's voluntary carbon offset program**. The tract currently stands as unproductive farmland. Revenue from carbon offset contributions will provide the funding to pay the costs not only of setting aside land for the project, but also of planting trees and managing the project.

By reforesting these private lands, the Conservancy **will protect land and restore critical habitat that will store forest carbon**. This region is a priority for conservation because:

- Deforestation has left islands of remnant forests surrounded by agriculture – reforestation will serve to connect small existing forest tracts to create **critical wildlife corridors**;
- It **supports the largest-known population of the Louisiana Black Bear**;
- It contains **several priority bird conservation areas**; and
- It **hosts rare and endangered fish, mussels and aquatic ecosystems** that are affected by adjacent agricultural lands.



## Conclusions

- *U.S. agriculture and forestry together have a rather sizeable potential to mitigate the buildup of greenhouse gases.*
- *Existing and future carbon markets offer opportunities for agricultural land owners to realize some income as well as provide environmental benefits from carbon sequestration projects.*
- *Carbon markets are relatively new, rapidly growing, and evolving and there are many uncertainties yet to be resolved .*
- *Existing conservation stakeholder groups should work together to identify and prioritize synergistic projects where possible.*

Questions?

