

Climate Change Conservation Initiative

An Opportunity for Soil, Water and Natural Resources Conservation

NY SWCS annual meeting

11/13/08



paul.salon@ny.usda.gov

“With a certainty exceeding 99 percent ...We have used up all slack in the schedule for actions needed to defuse the global warming time bomb. The next president and congress must define a course next year in which the United States exerts leadership commensurate with our responsibility for the present dangerous situation.”

James Hansen 6/23/08 <http://arxiv.org/abs/0804.1126>

Dr. James Hansen, Physicist first gave testimony to Congress on global warming in June 23, 1988. Director of NASA Goddard Institute for Space Studies

Safe levels of CO2 is no more than 350 ppm. Today they are 385. Recent best case scenarios were shooting for 550 ppm²

Climate Change Conservation Initiative

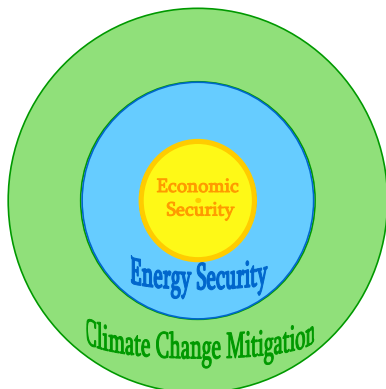
Alliances need to be built between State, County and Federal Agencies, Universities, NGO's and Industry Stake holders similar to Grazing Land Conservation Initiative and Conservation Tillage Alliances. To leverage all resources in utilizing our expertise in the endeavor.

3

Peak oil, Energy Independence, Economy CNN:

- Oil nears \$140 per barrel (IT WILL BE BACK)
- President Bush states America must get off its habit of oil to reduce its dependence on foreign oil.
- World Markets down 20% due to fear of US economic slowdown
- China has just surpassed US in GHG emissions
- Global Climate Change
- Research from NASA's Jet Propulsion Lab finds that the glaciers in Greenland are melting faster than previously predicted and the rate of loss doubled between 1996 and 2005.

4



5

Public Opinion

	Total %	Due to		
		human activity	natural patterns	No solid evidence
Very serious	41	66	31	11
Somewhat serious	33	29	42	24
Not too serious	13	3	17	28
Not a problem	11	2	10	36
Don't know	2	2	2	1
	100	100	100	100
Number of cases	(140)	(97)	(10)	(37)

PEW Research Center 2006 data

6

"What in your opinion is the single biggest environmental problem the world faces at this time?" If "air pollution" or "pollution":
 "What about air pollution/pollution do you have in mind?"

	7/08 %	4//07 %	3/07 %
Climate change	25	33	16
Air pollution	12	13	13
Energy problems	11	7	10
Pollution (misc.)	7	8	7
Toxic substances	6	6	7
Water pollution	5	5	6
Loss of habitat/Overdevelopment	4	4	7
Waste/Not enough recycling	4	3	9
Other	14	11	16
None	3	1	2
Unsure	8	8	7

7



History

- In 1935 The Soil Conservation and domestic allotment act establishes the SCS and SWCD's. To address soil erosion, productivity and moisture conservation.
- CCC 3 billion trees planted from 1933-1942.
- In 1972 Clean Water Act and Rural Development Act. Prioritized water quality
- In 1977 Soil and Water Resources Conservation Act and and Food and Agriculture Act. Further mandated to reduce agricultural pollution and non point pollution.

- In 2007 Energy Independence and Security Act
- Span of 30 years covering a span of a career encourage and attract new employees.

In 2007 The Energy Independence and Security Act

set mandatory renewable fuels standards for production of 36 billion gallons of alternative liquid fuels by 2022.

21 of the 36 billion gallons be produced exclusively through the more advanced cellulosic conversion technology by 2022 (210 - 250 million tons approx 50 million acres)

2008 Farm Bill Title IX Energy Biomass Crop Assistance Program

9

Stabilization Wedges: Solving the Climate Problem for The Next 50 Years with Current Technologies.

Pacala and Socolov. 2004. Science, (305) 968-971.

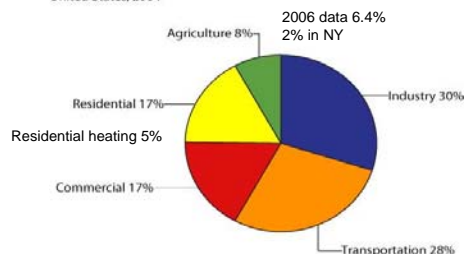
Energy efficiency and conservation (4)

- Fuel Shift (9)
wind and **biomass for fuel**
Synthetic gas from coal with carbon capture and storage
- Forest and Agricultural Soils (2)
Reduced deforestation plus reforestation and plantations
Conservation tillage and Conservation Practices,
Carbon sequestration

10

Greenhouse Gas Emissions by Sector

United States, 2004



Total Emissions* = 7,074 MMT CO₂E

* Net Emissions (Sources + Sinks) = 6,204 MMT CO₂E

** High GWP Gases include: HFCs, PFCs, and SF₆

Data expressed in Million Metric Tons of Carbon Dioxide Equivalents (MMT CO₂E)

Source: US EPA Inventory of Greenhouse Gas Emissions and Sinks, 2006.

electric imbedded in these figures 34%

11

<http://www.epa.gov/climatechange/emissions/index.html>

Agricultural Contributions to GHG

Agriculture 6.5% of total 85% of which is non CO₂ (2006 EPA)

N₂O – Nitrous Oxide 296x more potent than CO₂ (IPCC, 2001)

N₂O is only 5.2% of total US emissions, 72% emissions from agriculture (**3.7% of total**). Mostly from nitrogen fertilizer denitrification.

CH₄ – Methane 23x more potent than CO₂

7.9% of total US GHG emissions, 30% of total US emissions from agriculture, (**2.4% of total**). Mostly from enteric fermentation 72%, manure 24%.

Lower feed quality and/or higher feed intake lead to higher CH₄ emissions.

CO₂ – mostly due to energy use on farm and in the manufacture and transport of agriculture products (15% of agriculture)

Effects of Climate Change

on Soil and Water

- Increase intensity of 2inch 24 hr storms – more erosion potential
- Increase frequency of 25 yr storms
- Increase flooding and emergency watershed protection (EWP)
- Stream bank erosion issues
- Drought stress in summer increase need of conservation tillage and soil quality practices, irrigation.

13

Biofuel Impact and Opportunity

- Near term impact on increased corn and soy production until conversion processes are worked out for cellulosic ethanol. Requires more and revised conservation planning.
- Avoid Sod/swamp busting of marginal and CRP land
- Request for drainage technical assistance
- Need for improved forage management to reduce impact on high grain prices
- Assess land capability and productivity through soil survey and GIS for perennial grass biofeedstocks or residue removal help locate refineries (energy sheds)
- Increase need for conservation practices: Conservation tillage, cover cropping, and permanent vegetative cover and agro-forestry to reduce CO₂ emissions and carbon sequestration and trading
- Maintain wildlife habitat, diversity and reduce invasive species

14

Conservation Practices:

- Forest riparian buffers
- Tree planting
- Wind breaks
- No-till and zone till
- Cover cropping (recycle, reduce, remove N + carbon seq.)
- New emphasis on crop rotations
- Manure management
- Fertilizer management.
- Methane digesters and covering lagoons
- Warm season grasses, willows and other perennial biofeedstock establishment and management.

What other practices can help reduce ghg emission, Increase energy efficiency and carbon sequestration???

15

Fertilizer Nitrogen BMP's to Limit Losses that Contribute to Global Warming.

(C.S. Snyder IPNI)

- Any fertilizer BMP that increases (economic) crop yields, nutrient uptake, and recovery of applied nutrients is likely to minimize or limit the potential for undesirable nutrient losses to water and air resources (GHG).
- More research is need to further improve our knowledge of fertilizer N effects on GHG emissions. NO₃- conservation leads to susceptibility of N₂O emissions, may conflict with existing BMP's

16

Carbon Sequestration

- No-till plus cover crop (where applicable and verifiable)
- Agroforestry practices
- Windbreaks
- Living snow fence
- Riparian Buffers
- Biofeedstock Production
- Tree plantations value added hardwood/biofeedstock system
- 3 billion trees planted with CCC
Establishing 20 million acres x 150 tree/ac
(1 – 2 % US annual GHG emissions)

17

Biofeedstocks: USDOE/USDA- Billion-Ton Annual Supply Report



The 30% goal for liquid fuels set by the joint biomass advisory committee to USDA and DOE would require 1 billion dry tons of biomass bioenergy feedstock per year by 2030.

Is the US capable of producing a sustainable supply of biomass to meet this goal AND continue to supply food, feed, fiber and export demands?

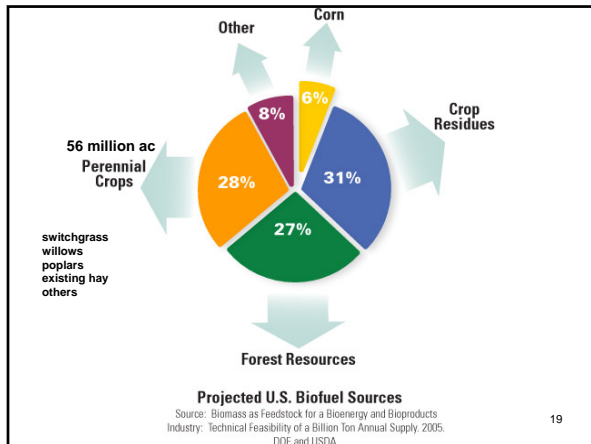
YES ?/NO!!

The report considered the two largest potential biomass sources: Forest and Agricultural land, and found that the US has a sustainable potential exceeding 1.3 billion dry tons per year.

This would be enough biomass to meet more than one-third of our current demand for transportation fuels.

18

Source: Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply, USDOE/EERE, Biomass Program (2005)



State Renewable Energy Portfolio Standards for Electricity Production

- Maine has 30% by 2000 and another 10% by 2017.
- New York renewable energy portfolio 24% of electricity needs to be produce by renewable energy sources by 2012
- There are 25 states + D.C which have renewable energy standards.
- Regional Greenhouse Gas Initiative (11 governors signed on) initially covering carbon dioxide emissions from power plants in the region. Includes cap and trade outside the electricity sector i.e. agriculture
- AES Energy Corp. on Seneca Lake has been retooled to burn 100,000 tons of biomass/year

20

Burning vs Conversion to Ethanol ?

- Burning is more efficient than conversion to ethanol resulting in a minimum of 8 times the greenhouse gas reduction benefit of converting corn to ethanol
- Replacing liquid fossil fuels for heating with grass or wood should result in 4 to 8 times more useable energy available for transportation then converting the same amount of corn into ethanol
- If all of the corn and soybean crop was used for fuel – it would equal 12% of diesel and 6% of gasoline used in the U.S.

21

Objective of Climate Change Conservation Initiative

- To build alliances between County, State, Fed. Univ., NGO's and Industry
- To evaluate all practices for their impacts on greenhouse gas emissions, carbon sequestration, and energy conservation
To support the production of biofeedstocks on marginal land in a sustainable manner with regard to soil, water, air, plants, animal & human resources
- To recognize climate change reduction and mitigation as a high priority in the NRCS strategic plan, FO operations & programs

22

NRCS & SWCD's have a unique multi-state technical capability with conservation practices EFOTG. We have the use of soils and GIS. We have the tools, the people and the program funding. We have the working relationships with land-owners. to implement the mandate.

We have a Plant Materials Program which has already produced the varieties of warm season grasses being heavily invested for use in the biofeedstock industry.

General Public more aware of climate change than water quality issues. There is the potential to increase NRCS funding to support these activities in a time when there will be increased competition for federal funding. New administration and new leadership within the NRCS ecological division.

23

Partnerships with wildlife and land preservation organizations and agencies.

NRCS & SWCD has partnerships with NGO's such as the Nature Conservancy, USFWS and State Wildlife Agencies. It will take buy in from all levels and organizations to provide input necessary for sustainable ecological biofeedstock production. We may need to build in refuges for wildlife, pollinators and other wildlife management considerations.

24

References:

National Academy of Science Understanding and responding to Climate Change 2008 edition
<http://dels.nas.edu/basc/climate-change/>

NRCS Global Climate Change Website
http://soils.usda.gov/survey/global_climate_change.html

Biomass as feedstock for a bioenergy and bioproducts industry . The technical Feasibility of a Billion ton annual supply USDA-DOE Billion ton Report
http://feedstockreview.ornl.gov/pdf/billion_ton_vision.pdf

Green house gas emissions from cropping systems and the influence of fertilizer Management IPNI
<http://www.ppi-ppic.org/ipniweb/portal.nsf/0/D27FE7F63BC1FCB3852573CA0054F03E>

Inventory of US greenhouse gas emissions and sinks: 1990-2006
<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

Target Atmospheric CO₂. Where Should Humanity Aim? (James Hansen et. Al.)
<http://arxiv.org/abs/0804.1126>

25

End

26

Billions of dollars are being invested in cellulosic ethanol technology

3/4/08 USDA, DOE invest 18.4 million for biomass research for biofuels and products

Cornell receives 10 million from NYS to build cellulosic ethanol conversion lab

Mascoma funded 4.9 million to build a 10% scale validation project in Rome NY

Chevron, BP funding UC Davis, Iowa State, UC Berkely and Penn. State

27

NRCS Should take the leadership role in climate change mitigation on private lands. Like we did with conservation tillage and rotational grazing

It takes 70 days to grow a crop of grass pellet fuel

It takes 70 million years to grow a crop of fossil fuel

28

Reports: USDOE/USDA- Billion-Ton Annual Supply



How could we accomplish this?

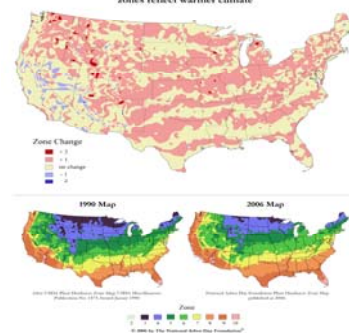
The report makes the following assumptions.

- Yields of corn, wheat and other small grains have increased by 50%;
- Soybeans have an increased residue-to-grain ratio of 2:1;
- Harvest technology is capable of taking 75% of annual crop residues (when removal is sustainable); (not sustainable by new accounts)
- All cropland is managed with no-till methods;
- 55 million acres of cropland, idle cropland, and cropland pasture are dedicated to the production of perennial bioenergy crops;
- All manure in excess of that which is applied on-farm for soil improvement under anticipated EPA restrictions is used for biofuel; and
- All other residues and wastes are utilized.

29

Source: Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply, USDOE/EERE, Biomass Program (2005)

Differences between 1990 USDA hardiness zones and 2006 arboresday.org hardiness zones reflect warmer climate



30

"Do you think the federal government should do more than it's doing now to try to deal with global warming, should do less than it's doing now, or is it doing about the right amount?"

	More %	Less %	AboutRight %	Unsure %
7/23-28/08	61	10	27	2
4/5-10/07	70	7	21	2
3/9-14/06	68	5	25	1

31

Forest Land

Forest Service and DOE sees potential for sustainable forest management and tree plantations to produce a large supply of biofeedstocks.

A managed forest sequesters more carbon

There will be an increasing need for NRCS technical and financial assistance to encourage forest management and to reduce the effects of this biofeedstock removal on soil and water resources.

32

Switchgrass produced 540% more renewable than nonrenewable energy consumed.

Switchgrass monocultures managed for high yield produced 93% more biomass yield an equivalent estimated NEY (net energy yield) than previous estimates.

Estimated average greenhouse gas emissions from cellulosic ethanol derived from switchgrass were 94% lower than estimated GHG from gasoline.

Based on yields from current cultivars and technology from 2000 (Ken Vogel).

33

Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies.

S. Pacala¹ and R. Socolov²
Princeton University

- 1) Dept. of Ecology and Evolutionary Biology
- 2) Dept. of Mechanical and Aerospace Engineering

13 August 2004 Vol. 305 Science

34

What is meant by "Solving the Carbon and Climate Problem for the next half-century"

Proposals to limit atmospheric CO₂ to a concentration that would prevent most damaging climate change have focused on a goal of 500 ppm, or less than double the pre-industrial concentration of 280 ppm.

The current concentration is 375 ppm, stabilization at 500 ppm requires that emissions be held near the present 2004 level of 7 billion tons of carbon per year even though we are currently on course to more than double. (1 ton = 150 barrels of oil)

35