



**Plug Flow Digester**

**Reduced Tillage**

**Precision Agriculture**

**Conservation Buffers**

# ***Climate Change and Agriculture: How is USDA Helping Agriculture Respond***

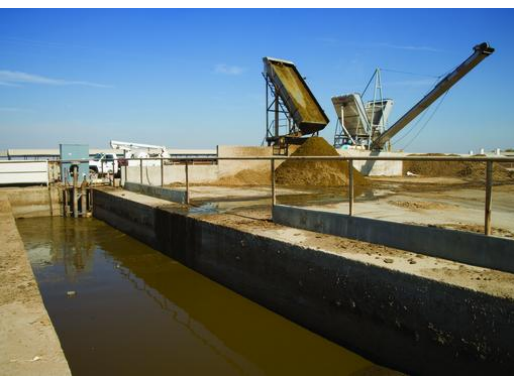
Jan Lewandrowski (USDA)

2016 Crop Insurance Workshop

Annapolis, MD

September 13, 2016

**Solids Separation**



**Cover Crops**

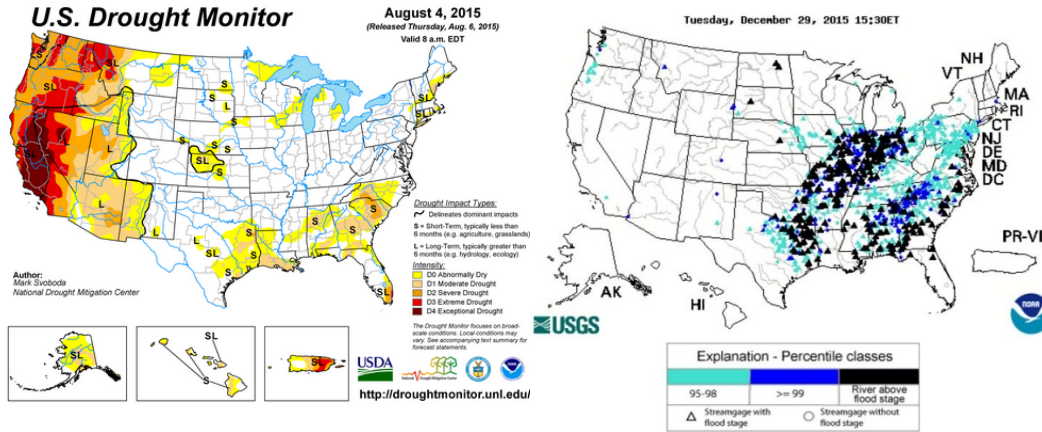


# Today's Roadmap

- The last 3 years – moving quickly
- Climate Change Program Office
- USDA Climate Hubs
- USDA Building Blocks for Climate Smart Agriculture and Forestry
- USDA GHG Inventory
- The Agencies



# Moving Quickly: We are seeing climate change



**Increased drought /flooding**

**Reduction in water tables**



**Longer wildfire seasons, more intense fires**



**Increasing pests and diseases**

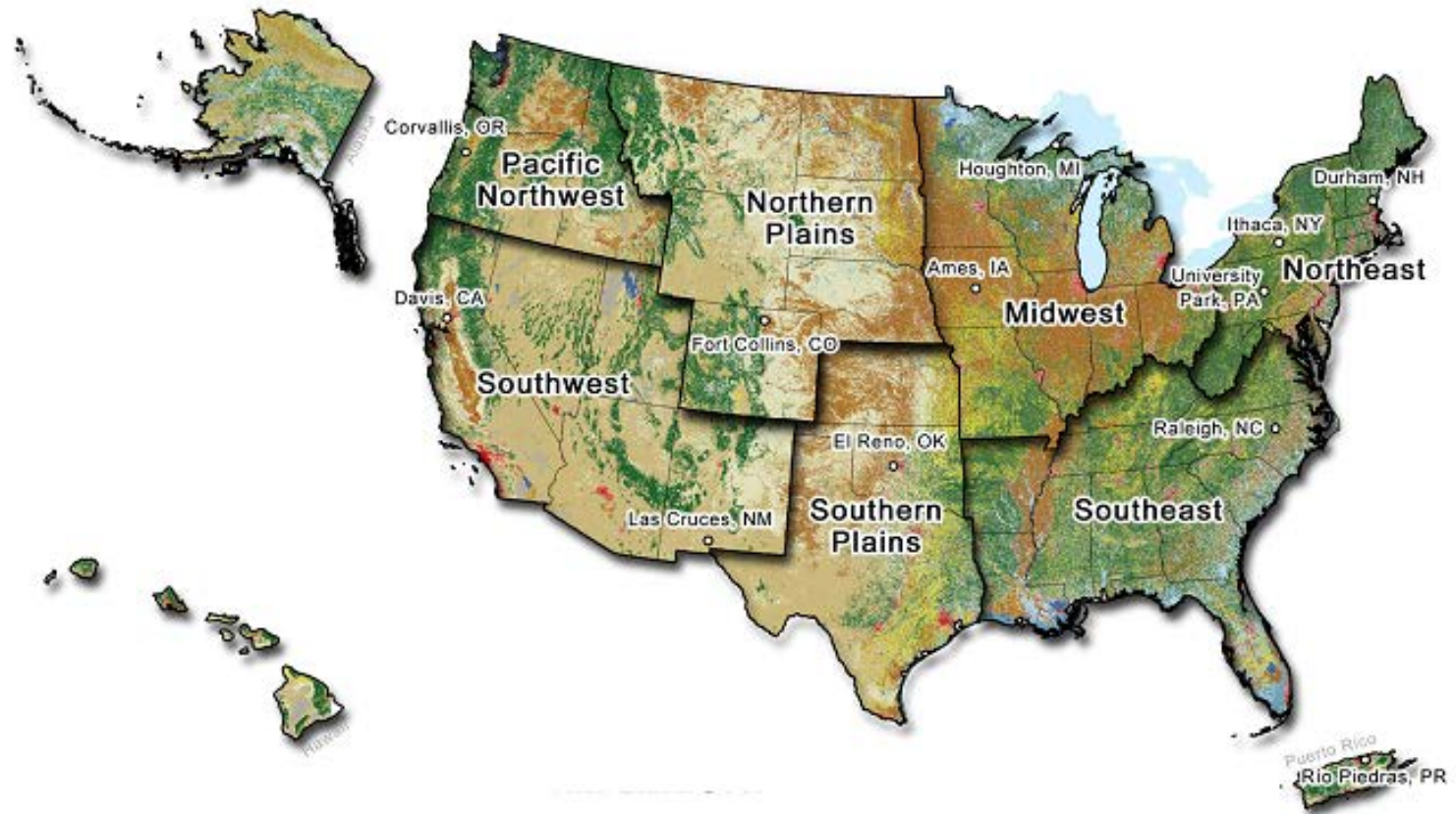
# Moving Quickly: Climate Policy

- In February 2014, Secretary Vilsack announced the establishment of a network of 10 USDA Climate Hubs and Sub Hubs
- On March 31, 2015 the U.S. submitted its target of reducing U.S. GHG emissions by 26-28% below 2005 levels by 2025
- On April 23, 2015 Secretary Vilsack outlined the building blocks and established a goal of reducing emissions by 120 MMTCO<sub>2</sub>e per year by 2025.
- The 2016 Conference of Parties to the U.N Framework Convention on Climate Change (UNFCCC) resulted in a new international framework for reducing global GHG emissions. As a Party to the agreement the U.S. formally committed to its 2015 target

# Roles of the Climate Change Program Office

- Serves as the USDA-wide coordinator of global change program and policy issues related to agriculture, rural and forestry,
- Ensures that USDA is a source of objective, analytical assessments of climate change impacts and proposed response strategies,
- Serves as USDA focal point for climate change issues:
  - responsible for coordinating activities with other Federal agencies,
  - interacting with the legislative branch on climate change issues affecting agriculture and forestry,
  - represents USDA on U.S. delegations to international climate change discussions.
- Coordinate synthesis reports, projections, and analysis

# USDA Climate Hubs



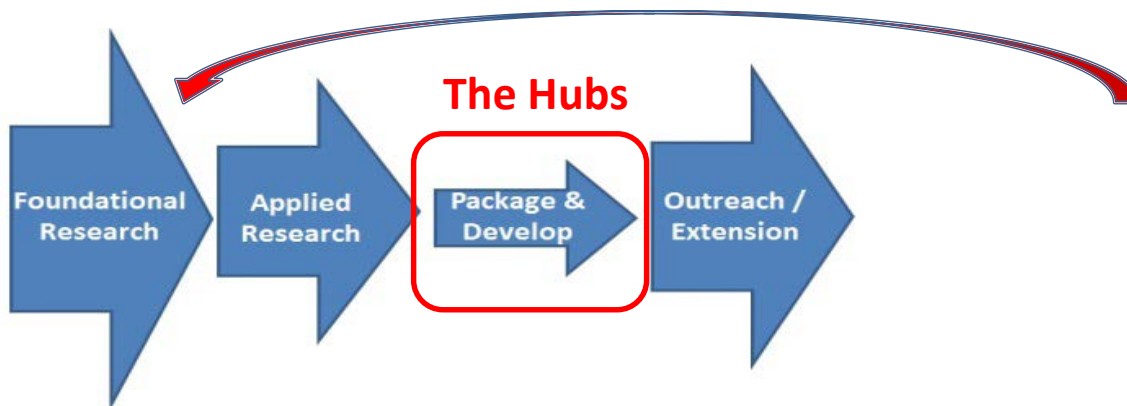
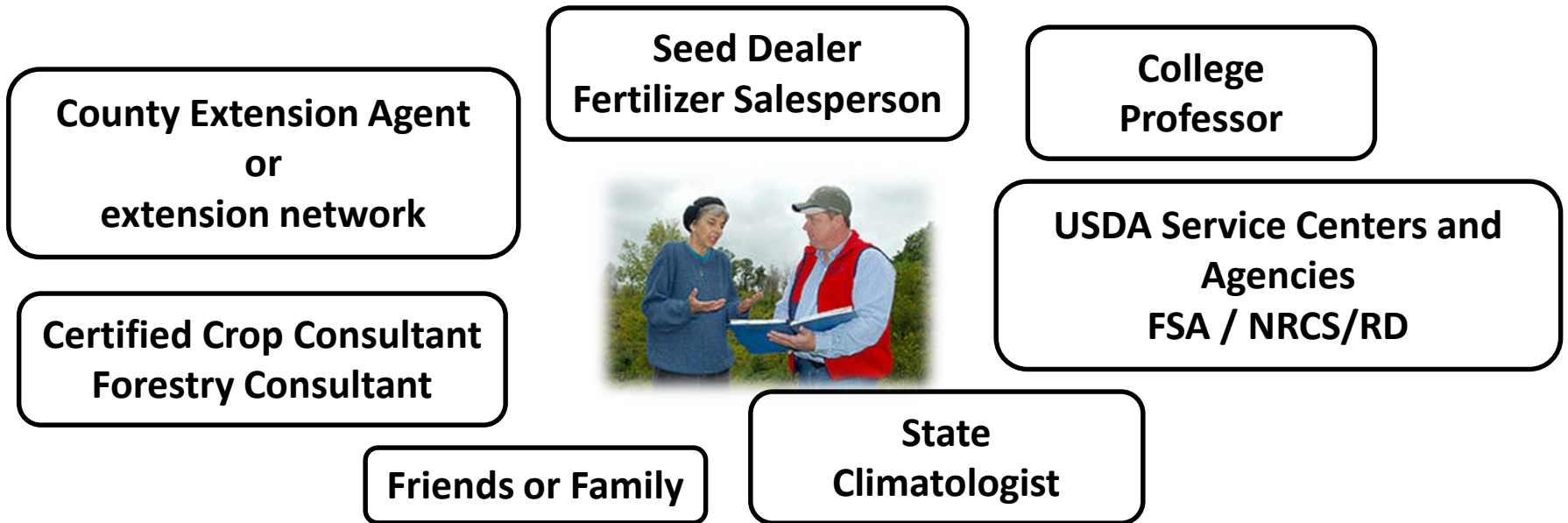
A network of 10 Regional Hubs and Sub Hubs

**Vision:** Agricultural production and natural resources maintained and strengthened under increasing climate variability and environmental change

**Mission:**

1. Develop and deliver science-based, region-specific information and technologies to agricultural and natural resource managers; to enable climate-informed decision-making; and
2. Direct land managers to USDA agency programs and regional partners to build resilience to climate
3. Coordinate USDA research with other Federal Climate networks (CSCs, RISA, LCCs).
4. Coordinate USDA “climate” activities within each Hub region.

# The Hubs use existing networks to reach our stakeholders



## Stakeholders

- USDA Service Agencies
- Cooperative Extension
- Land Grant Universities
- Farmers
- Ranchers
- Forest land owners



# USDA Climate Hubs: Recent Accomplishments

## Regional Vulnerability Assessments completed for all regions

[Home](#) » [Regional Vulnerability Assessments](#)

### Regional Vulnerability Assessments

#### Regional Vulnerability Assessments

USDA's Regional Climate Hubs were established in February of 2014 to deliver science-based knowledge, practical information, and program support to farmers, ranchers, forest landowners, and resource managers to enable climate-informed decision-making in light of the increased risks and vulnerabilities associated with a changing climate. As part of their function, the Hubs were tasked with providing periodic regional assessments of risk and vulnerability to production sectors and rural economies, building on material provided under the [National Climate Assessment](#) conducted through the United States Global Change Research Program (USGCRP).

Throughout 2015, eight regional vulnerability assessments will be published representing all of the Climate Hub regions across the country. They are being published on a rolling basis and are provided here as well as on the Regional Hubs pages. With the publication of these Vulnerability Assessments, the Regional Climate Hubs are providing their stakeholders with an introduction to the region, regional sensitivities and adaptation strategies for working lands, a greenhouse gas emissions profile with mitigation opportunities, and an overview of how partner USDA agencies are being affected by a changing climate. These vulnerability assessments are an important first step in establishing a baseline "snapshot" of current climate vulnerabilities, and provides region-specific adaptation and mitigation strategies to increase the resilience of working lands in the region.

Click on a region below to read about your region's vulnerabilities and adaptation/mitigation opportunities!



# USDA Climate Hubs: Recent Accomplishments

## Climate Hubs Tool Shed

About

Feedback

Smart Search

### Sector

- Agriculture
- Climate
- Ecosystem Services
- Forestry
- Grazing Land
- Livestock

### Region

- Caribbean
- Midwest
- Northeast
- Northern Plains
- Pacific Northwest
- Southeast
- Southern Plains
- Southwest
- Southwest - Pacific Islands

Search

Tools found: 140



Agriculture



Climate



Ecosystem Services



Forestry



Grazing Land



Livestock

The recently launched Climate Hubs Tool Shed is an online, searchable database of tools (data-driven, interactive websites and mobile apps) that can assist land managers, land owners, and extension professionals in adapting working lands to the impacts of climate change. <http://climatehubs.oce.usda.gov/content/tools-and-data>

# USDA Climate Hubs: Find out more at:

[www.usda.gov/climatehubs](http://www.usda.gov/climatehubs)

The screenshot displays the USDA Climate Hubs website interface. At the top left is the USDA logo and the text "United States Department of Agriculture CLIMATE HUBS". A search bar is located at the top right. Below the header is a navigation menu with items: "Hubs Home", "What's New", "Climate Change Resources", "Adaptation Assistance", "Regional Hubs", and "About Us".

The main content area is titled "Climate Hub Regions" and features a map of the United States divided into eight regions: Pacific Northwest, Northern Plains, Southwest, Midwest, Northeast, Southern Plains, Southeast, and Puerto Rico. Each region is labeled with its name and a representative city. Below the map is a blue button that says "Click on the region to learn more about the USDA Climate Hub in your area".

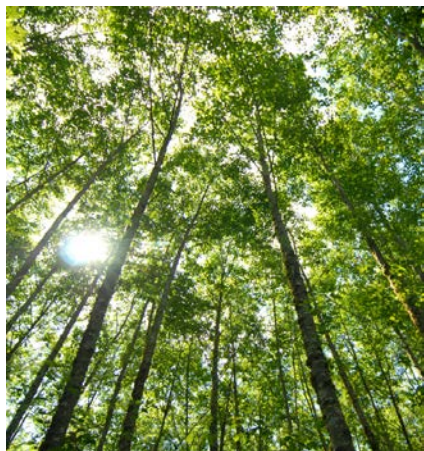
To the right of the map is a sidebar with social media icons for Facebook, Twitter, Google+, RSS, YouTube, and Flickr. Below these icons is a "Popular Topics" section with a list of links: "Climate Hubs Factsheet", "Climate Hubs Mission and Vision", "Carbon Tools", "Drought Tools", "Events Calendar", "Climate Smart Agriculture", "Partners", and "Contact Us".

At the bottom of the page are three content sections:

- News:** A list of three news items with a "more..." link.
- Focus on Climate:** A list of four topics with corresponding images: Croplands, Forestlands, Livestock, and Grazing Lands.
- Events Calendar:** A calendar for the month of January, showing dates from 1 to 31.

The footer contains a long line of text with various links: "USDA.gov | Policies & Links | Our Performance | Report Fraud on USDA Contracts | Visit OIG | Plain Writing | Open | Digital Strategy | FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Information Quality | USDA Recovery | USA.gov | Whitehouse.gov".

# USDA Building Blocks for Climate Smart Agriculture and Forestry



# What is Climate-Smart Agriculture and Forestry?

- Promotes increases in agricultural and forest productivity and farm and forest incomes;
- Builds greater resilience to climate change for forest and agricultural systems;
- Reduces and removes greenhouse gas emissions associated with agriculture, forests, and land use change; and
- Increases renewable energy production from farms and forest biomass.

# Principles of the USDA Building Blocks

- **Voluntary and incentive-based** – Building on existing legislation and our history of “cooperative conservation.”
- **Focused on multiple economic and environmental benefits** – Through efficiency improvements, improved yields, or reduced risks.
- **Meet the needs of producers** – By focusing on working farms, ranches, forests, and production systems.
- **Assess progress and measure success** – Through quantitative goals and objectives.
- **Cooperative and focused on building partnerships** – With industry, farm groups, and conservation organizations.

# The Ten Building Blocks



## *Soil Health*

Goal: Increase soil carbon through healthy soil management practice

2025 Mitigation Target: 4.0 – 18.0 MMT CO<sub>2</sub>e



## *Nitrogen Stewardship*

- Goal: 64M acres under nutrient management to reduce N<sub>2</sub>O emissions
- 2025 Mitigation Target: 7 MMT CO<sub>2</sub>e



## *Livestock Partnerships*

- Goal: 500 new digesters, cover 10% of anaerobic lagoons (dairy and swine)
- 2025 Mitigation Target: 21.2 MMT CO<sub>2</sub>e

# The Ten Building Blocks



## ***Conservation of Sensitive Lands***

- Goal: 400,000 acres in CRP with high GHG benefits, protect 40,000 acres with easements, transfer expiring CRP acres to permanent easements
- 2025 Mitigation Target: 0.8 MMT CO<sub>2</sub>e



## ***Grazing and Pasture lands***

- Goal: Establish grazing management plans on additional 9 million acres
- 2025 Mitigation Target: 1.6 MMT CO<sub>2</sub>e

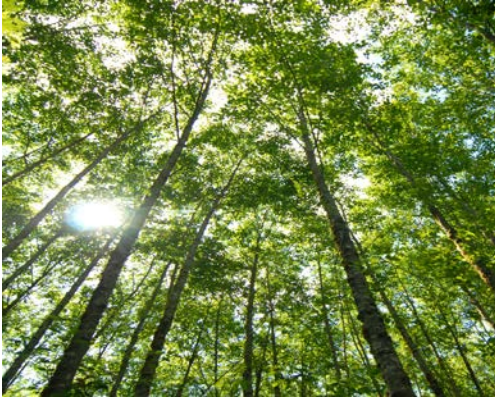


## ***Stewardship of Federal Forests***

- Goal: Reforest 32,000 acres in National Forests
- 2025 Mitigation Target: 2.5 MMT CO<sub>2</sub>e



# The Ten Building Blocks



## *Private Forest Growth and Retention*

- Through FLP and CFP, protect almost 1 M acres of working landscapes, and establish trees and shrubs on an additional 1 million acres through NRCS programs
- 2025 Mitigation Target: 4.8 MMT CO<sub>2</sub>e



## *Promotion of Wood Products*

- Goal: Increase medium rise buildings made with wood annually from 440 in 2015 to 900 in 2025
- 2025 Mitigation Target: 19.5 MMT CO<sub>2</sub>e



## *Urban Forests*

- Goal: Plant 100,000 additional trees in urban areas
- 2025 Mitigation Target: 0.1 MMT CO<sub>2</sub>e

# The Ten Building Blocks



## ***Energy Generation and Efficiency***

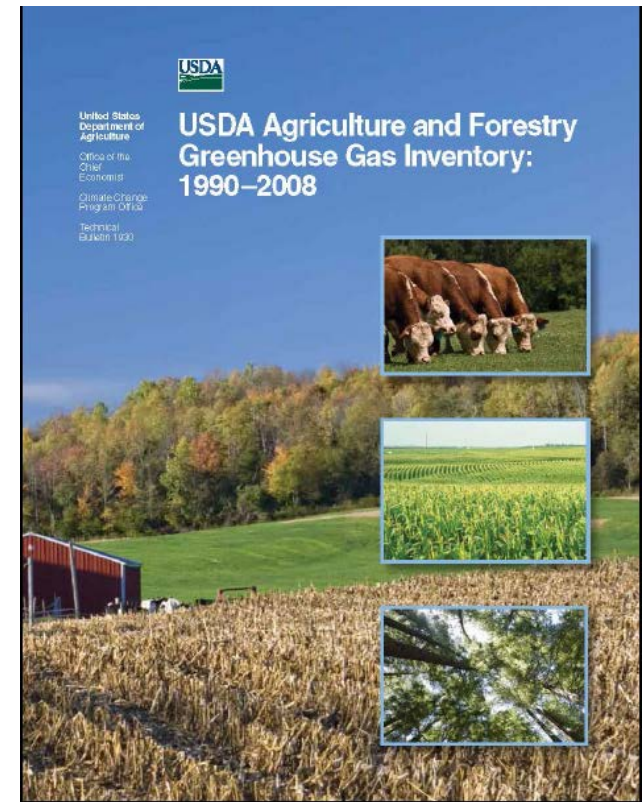
- Goal: Promote renewable energy technologies and improved energy efficiency through Rural Development energy programs
- 2025 Mitigation Target: 60.2 MMT CO<sub>2</sub>e

# Improving Agriculture and Forestry GHG Inventories

Every 2 years (about) USDA publishes a GHG Inventory covering source and sink categories in the U.S. agriculture and forestry sector

The inventory is consistent with:

1. The national GHG inventory published annually by U.S. EPA
2. The guidelines, methods, and reporting requirements of the UNFCCC



# Agriculture and Forestry processes captured by inventory

- Agriculture
  - Enteric fermentation ( $\text{CH}_4$ )
  - Manure mgmt. ( $\text{CH}_4$  and  $\text{N}_2\text{O}$ )
  - Fertilizers and manure applied to soils ( $\text{N}_2\text{O}$ )
  - Lime and urea applied to soils ( $\text{CO}_2$ )
  - Rice ( $\text{CH}_4$ )
  - Field burning of agricultural residues ( $\text{CH}_4$  and  $\text{N}_2\text{O}$ )
- Land Use, Land Use Change, and Forestry
  - Above/below-ground biomass
  - Dead wood and litter
  - Soil organic matter
  - Non- $\text{CO}_2$  emissions from land use/land use change

# UNFCCC reporting requirements

- US GHG Inventory covers 1990 to two years before present
- Inventory must be:
  - Transparent
  - Consistent
  - Complete
  - Comparable
  - Accurate
- Review: peer review and expert review
- Inventory methods should improve and uncertainties reduced over time

# USDA has formed a Building Blocks Metrics Team

- The team is assessing data and analytic needs to enable the Department to track progress in implementing the building blocks
- We have identified specific “conservation indicators,” e.g. acres no-till, manure mgmt for each building block
- Assessing current data availability
- Developing links between this data and US GHG Inventory methods and calculations
- This will inform agency performance metrics and national GHG inventory

# **USDA Agencies and Offices Helping Agriculture Respond to Climate Change**

# USDA Climate Change (CC) Programs (in \$1,000s)

	2015	2016	2017
	(Actual)	(Enact)	(Budget)
US Global CC Research	\$ 87,784	\$ 83,540	\$ 108,435
Agric Res Service	40,720	39,530	59,369
National Inst of Food and Agric	20,405	15,339	19,369
Forest Service	23,747	24,736	24,736
Other (ERS, NASS, NRCS)	2912	3,935	4,952
CC Adapt, Prepar & Resilience	\$ 1,245,705	\$ 1,218,626	\$ 1,247,998
Agric Res Service	3,470	5,470	5,470
Natural Res Cons Service	76,354	4,170	18,470
Forest Service	1,163,216	1,205,164	1,219,625
Office of the Chief Econ	2,665	2,551	3,015
Other (APHIS, RMA, FSA)	0	1,271	1,418
International Assist (all FS)	\$ 3,000	\$ 3,000	\$ 3,000

Source: Our Changing Planet (2016)





## Climate Adaptation and Mitigation for Wheat Production Systems of the Inland Pacific Northwest

### Objectives

- Identify and implement management approaches and technology that
  - impart resilience to climate change
  - reduce GHG emissions
- Extend project information to producers and others
- Educate next generations: K-20



### Approach

- Integrated effort involving biologists, agronomists, climate modelers, economists, entomologists, sociologists, educators, extension educators
- Regional, with 3 universities, ARS, >200 participants (PIs, students, others)
- Stakeholder input from inception
- 75:12:13, Research:Education:Extension

### Impact

- Prepared farmers and stakeholders capable of managing climate/agriculture issues
- Climate resilient, sustainable wheat production in the PNW
- Physical and cyberinfrastructure to support continued integration across disciplines and institutions in the PNW

*Objective:*

To assess productive corn-based cropping systems to find those with a lighter environmental footprint under changing climate conditions that farmers will adopt and policy makers will support.



*Approach:*

Evaluate novel and widely utilized farmer practices across the CSCAP research network; apply models to integrate and synthesize field, climate and social-economic data to assess cropping system vitality; interactively connect research to stakeholders via extension programs; and develop education curricula targeting high school teachers.

*Impact:*

Heighten system capacity to: (1) retain and enhance soil organic matter nutrient carbon stocks (2) reduce field nitrogen losses that contribute to GHG emissions and water pollution, (3) better withstand droughts and floods, and (4) ensure productivity under different climatic conditions. Analyses and recommendations will equip farmers and policy makers in addition to simultaneously training the next generation of scientists and citizens.

# ARS Research in Natural Resources & Sustainable Agricultural Systems



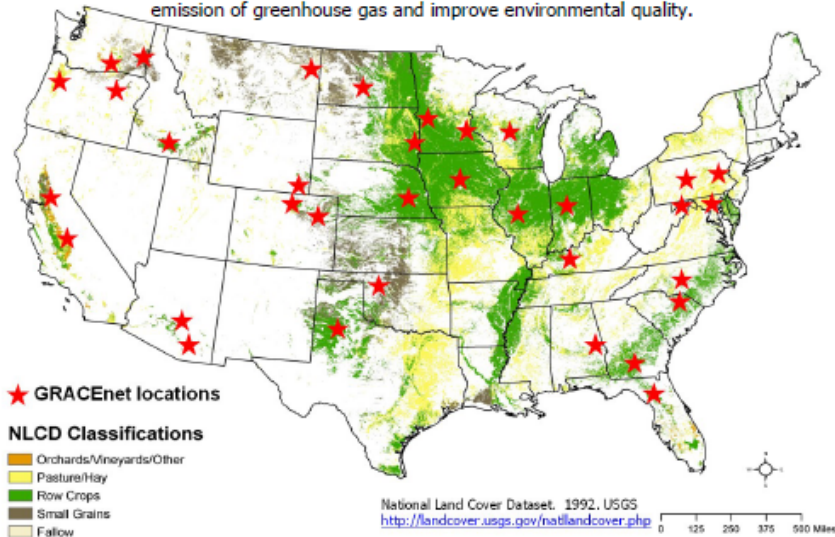
- **450** Scientists
- **139** Research Projects
- **62** Locations

- **Water Availability & Watershed Management**
- **Climate Change, Soils, and Emissions**
- **Bioenergy and Energy Alternatives**
- **Agricultural and Industrial Byproducts**
- **Pasture, Forage, and Rangeland Systems**
- **Agricultural System Competitiveness and Sustainability**

# Greenhouse gas Reduction through Agricultural Carbon Enhancement network GRACEnet

## GOAL

Identify and develop agricultural strategies to enhance soil carbon sequestration and reduce greenhouse gas emission and to provide a scientific basis for carbon credit programs, to reduce net emission of greenhouse gas and improve environmental quality.



## APPROACH

Consistent protocols for soil, trace gas and plant sampling are used across the network.

Assessment within GRACEnet follows four location-specific scenarios:

1. Business as usual in production agriculture for various areas of the country.
  - What is the carbon accumulation/loss rate under typical agricultural management?
2. Maximizing carbon sequestration rate.
  - What can be done to reach the highest carbon sequestration rate?

3. Minimizing net greenhouse gas emission.
  - Agriculture is the main source of nitrous oxide and methane to the atmosphere. Practices will be developed to decrease the emission of these gases. What can be done to reach the highest carbon sequestration rate?
4. Maximizing environmental benefits by improving water, air, and soil quality.
  - This scenario investigates management systems to optimize both agricultural and environmental benefits, by sequestering soil carbon and decreasing greenhouse gas emissions.

## OBJECTIVES

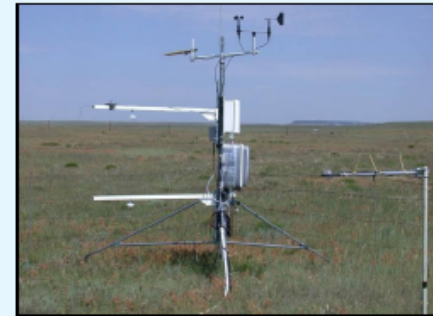
1. Evaluate status and direction of change in soil carbon for typical and alternative agricultural systems.



2. Determine net greenhouse gas emission (carbon dioxide, methane and nitrous oxide) of current agricultural systems for typical and alternative agricultural systems.



3. Determine the environmental effects (water, air and soil quality) of agricultural systems developed to reduce greenhouse gas emission and increase soil carbon storage.



From the GRACEnet brochure at:

[http://www.ars.usda.gov/research/programs/programs.htm?np\\_code=212&docid=21223](http://www.ars.usda.gov/research/programs/programs.htm?np_code=212&docid=21223)

# NRCS

**From its list of approved conservation practices, NRCS has identified those with GHG benefits**



Climate Change Mitigation Building Block	Conservation Practice Standard
Soil Health	327 Conservation Cover (ac)
	328 Conservation Crop Rotation (ac)
	329 Residue and Tillage Management, No Till (ac)
	329A Strip Till (ac)
	329B Mulch Till (ac)
	330 Contour Farming (ac)
	332 Contour Buffer Strips (ac)
	340 Cover Crop (ac)
	345 Residue and Tillage Management, Reduced Till (ac)
	386 Field Border (ac)
	393 Filter Strips (ac)
	412 Grassed Waterways (ac)
	585 Stripcropping (ac)
	601 Vegetative Barriers (ft)
	603 Herbaceous Wind Barriers (ft)
<b>Nitrogen Management</b>	590 Nutrient Management (ac)
<b>Livestock Partnership</b>	366 Anaerobic Digester
<b>Grazing and Pasture</b>	512 Forage and Biomass Planting (ac)
	528 Prescribed Grazing
	528A Prescribed Grazing
	550 Range Planting
<b>Agroforestry (not an official Building Block but benefits present)</b>	380 Windbreaks and Shelterbelts (ft)
	381 Silvopasture Establishment (ac)
	390 Riparian Herbaceous Buffer (ac)
	391 Riparian Forest Buffer (ac)
	612 Tree and Shrub Establishment (ac)
	645 Upland Wildlife Habitat (ac)
	650 Windbreak Renovation (ft)
<b>Rice (not an official Building Block but benefits present)</b>	436 Irrigation Reservoir (ac-ft)
	447 Irrigation Tailwater Recovery (no.)

## Get Started with NRCS



Do you farm or ranch and want to make improvements to the land that you own or lease? NRCS offers technical and financial assistance to help farmers, ranchers and forest managers. Here's how you can get started with NRCS:

### 1 Planning

To get started with NRCS, we recommend you stop by your [local NRCS field office](#). We'll discuss your vision for your land.

# Environmental Defense Fund CIG Projects

Water and Residue Management

Methane and Nitrous Oxide  
Emission Reductions

*CIG Team Members*

EDF  
ENVIRONMENTAL DEFENSE FUND  
Finding the ways that work

California Rice

Wi  
WINROCK INTERNATIONAL

Terra  
GLOBAL CAPITAL

WHITE RIVER  
IRRIGATION DISTRICT

DNDC-ART  
DRAINAGE NITROGEN REDUCTION CENTER

prbo



One of the Eligible Practices in CA: Dry Seeding

Jim Morrison | CIG | 2012

Quantification  
and  
Aggregation

SALE

California's  
Regulatory  
Market (AB32)

\$\$\$ Return to Producer  
for Avoided Emissions

# Synthesis Reports: Global Food Security

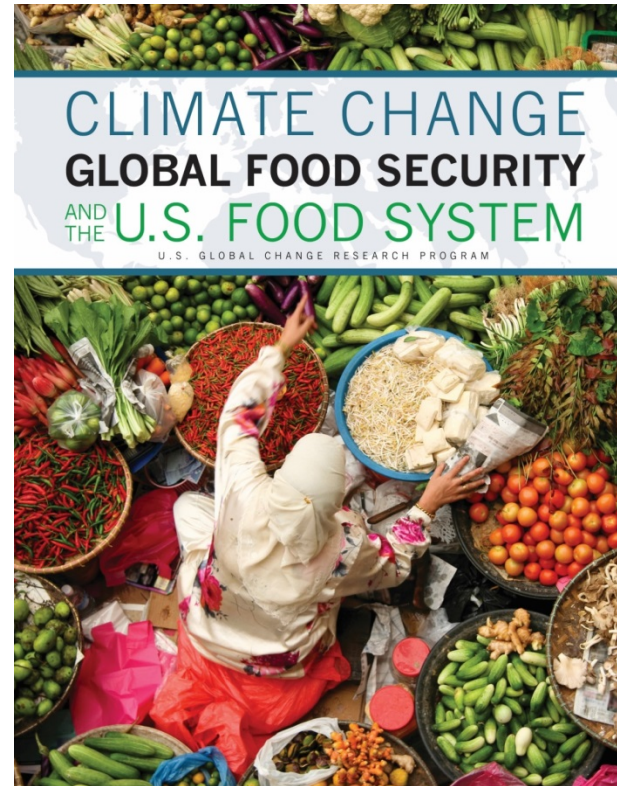
## Conclusions

Climate change is very likely to affect food security.

Risks are greatest for the poor and in the tropics.

Risks are magnified as the rate and magnitude of climate change increase.

Climate change risks to food security extend beyond agricultural production, and include all elements of the food system, such as production, storage, processing, transportation, and consumption





# Mitigation: GHG Mitigation Supply Curve for U.S. Agriculture

