

Dane County Council on Climate Change Aug. 8, 2018

- ▶ The Global Carbon Cycle
  - ▶ Darrell Zastrow, UW Extension
- ▶ Climate Change Mitigation - Forest Based Strategies
  - ▶ Darrell Zastrow, UW Extension
- ▶ Healthy Soils for Food Security and the Climate
  - ▶ Caryl Terrell, CRANES

WORK GROUP ON AGRICULTURE,  
FORESTRY & FOOD



## MEMBERS

- ▶ Derr Farms
- ▶ Clean Fuel Partners
- ▶ Center for Resilient Cities
- ▶ CRANES
- ▶ Wisconsin Energy Institute
- ▶ Alliant Energy
- ▶ City of Madison
- ▶ Yahara Pride & DBA
- ▶ UW Extension
- ▶ UW Center for Integrated Ag Systems
- ▶ WECC USA

Jamie Derr      Co-Chair  
John Haeckel  
Marcia Caton Campbell  
Caryl Terrell  
Gary Radloff    Co-Chair  
Michelle Olson  
George Reistad  
Maria Woldt  
Darrell Zastrow  
Pam Porter  
Robin Lisowski

# WORK GROUP ON AGRICULTURE, FORESTRY & FOOD

## Issues being discussed in Work Group

- ▶ Bio-digester expansion program
- ▶ Ag practices that lead to carbon sequestration
- ▶ Forestry practices that lead to carbon sequestration
- ▶ Other agriculture energy programs
- ▶ Policies that reduce carbon emissions resulting from water or inefficiencies in food systems
- ▶ Financing programs to implement these policies

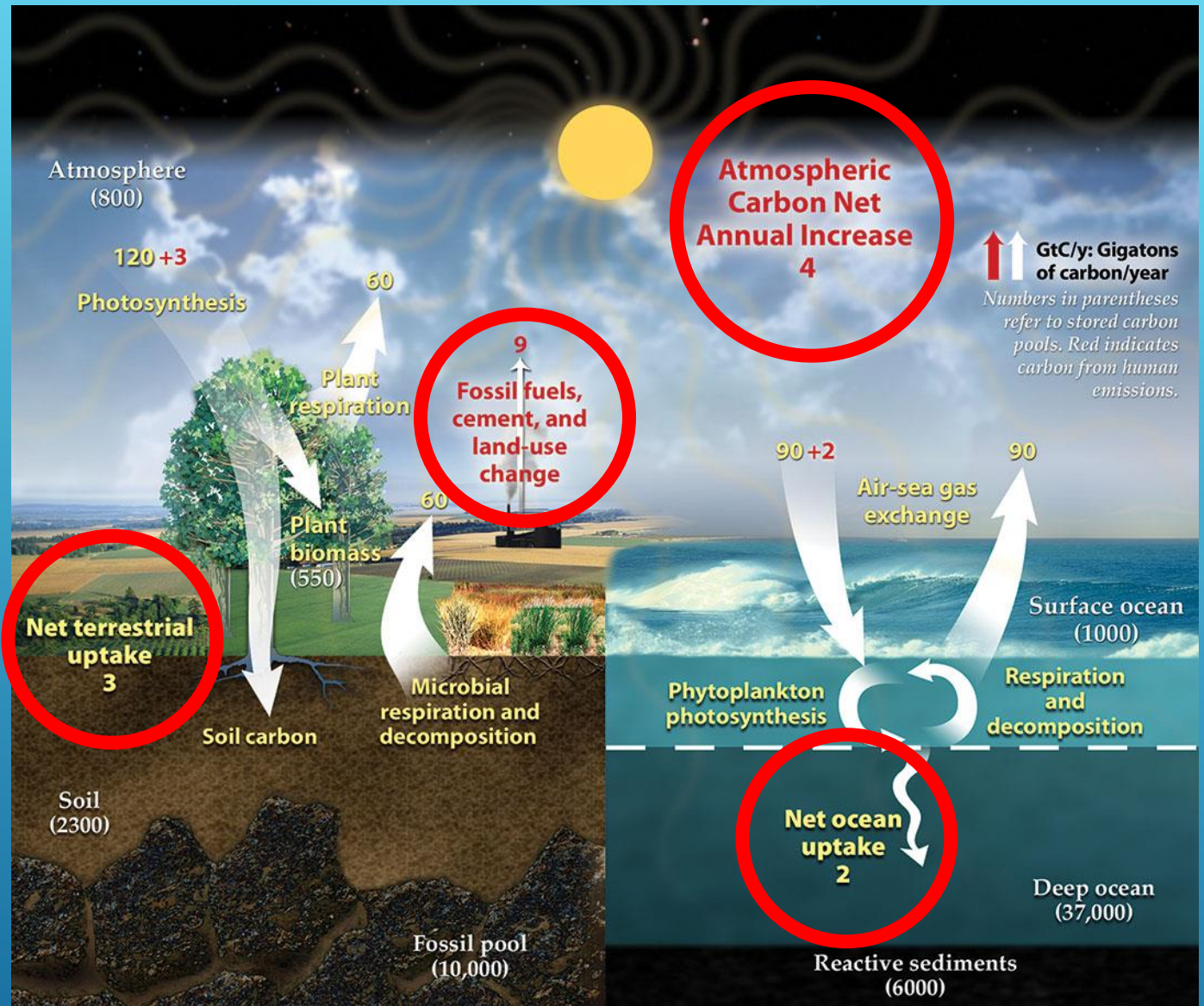
# WORK GROUP ON AGRICULTURE, FORESTRY & FOOD



Photo by Darin, 2008

# THE GLOBAL CARBON CYCLE

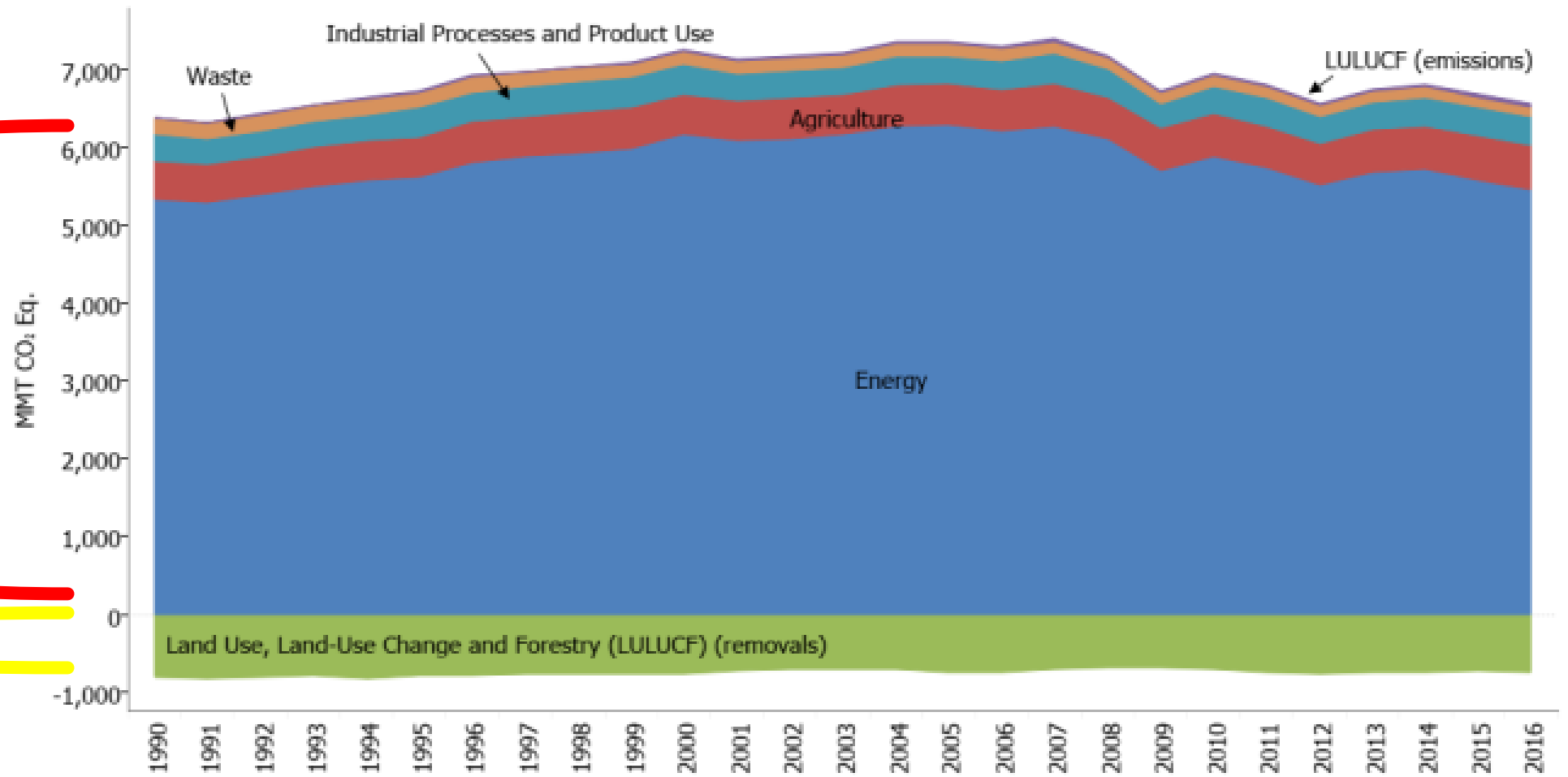




# WHERE DOES CARBON GO?

U.S. Department of Energy, 2008

**Figure ES-12: U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector (MMT CO<sub>2</sub> Eq.)**



U.S. Environmental Protection Agency, 2018

# CARBON SINKS IN THE UNITED STATES

- ▶ Land Use, Land-Use Change and Forestry's carbon contributions

**Table ES-5: U.S. Greenhouse Gas Emissions and Removals (Net Flux) from Land Use, Land-Use Change, and Forestry (MMT CO<sub>2</sub> Eq.)**

Gas/Land-Use Category	1990	2005	2012	2013	2014	2015	2016
<b>Carbon Stock Change<sup>a</sup></b>	<b>(830.2)</b>	<b>(754.2)</b>	<b>(779.5)</b>	<b>(755.0)</b>	<b>(760.0)</b>	<b>(733.4)</b>	<b>(754.9)</b>
Forest Land Remaining Forest Land	(697.7)	(664.6)	(666.9)	(670.9)	(669.3)	(666.2)	(670.5)
Land Converted to Forest Land	(92.0)	(81.6)	(74.9)	(74.9)	(75.0)	(75.0)	(75.0)
Cropland Remaining Cropland	(40.9)	(26.5)	(21.4)	(11.4)	(12.0)	(6.3)	(9.9)
Land Converted to Cropland	43.3	25.9	22.7	23.3	23.2	23.2	23.8
Grassland Remaining Grassland	(4.2)	5.5	(20.8)	(3.7)	(7.5)	9.6	(1.6)
Land Converted to Grassland	17.9	19.2	20.4	21.9	21.5	23.3	22.0
Wetlands Remaining Wetlands	(7.6)	(8.9)	(7.7)	(7.8)	(7.8)	(7.8)	(7.9)
Land Converted to Wetlands	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Settlements Remaining Settlements	(86.2)	(91.4)	(99.2)	(99.8)	(101.2)	(102.2)	(103.7)
Land Converted to Settlements	37.2	68.4	68.3	68.3	68.2	68.1	68.0

U.S. Environmental Protection Agency, 2018

# CARBON SINKS IN THE UNITED STATES

# CLIMATE CHANGE MITIGATION - FOREST BASED STRATEGIES

With the right incentive policies and programs in place, forests and forest products sequestration could be increased to offset an additional 5-7% of the country's fossil fuel emissions\*

\*Forest Carbon Solutions of Mitigating Climate Change – American Forest Foundation 2015

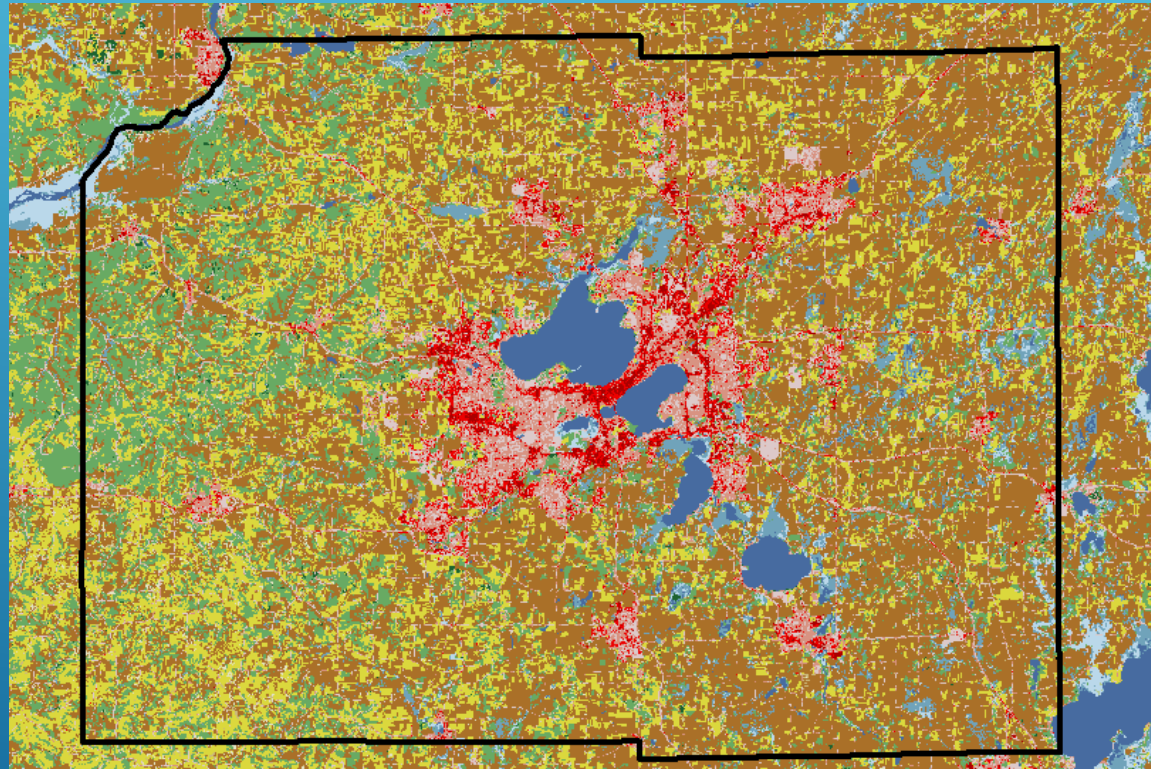


- ▶ Action Items needed to establish forest inventory of canopy and carbon stocks:
  - ▶ A) Assess **current** % of forest canopy cover in Dane County to establish a baseline.
    - ▶ Wisconsin DNR can help guide this process, but it must be a County-led effort
  - ▶ B) Correlate existing % canopy cover to total carbon sequestered as a baseline in current forest cover on private and public lands.
    - ▶ *Note: Possibly use USFS-developed I-Tree Landscape for this assessment. This tool calculates carbon sequestration and storage of trees, as well as human health benefits and stormwater reduction impacts.*
  - ▶ C) Explore other data sources, including Forest Inventory and Analysis (FIA)
    - ▶ Wisconsin DNR and the USFS can provide this data

## **ESTABLISH BASELINE FOREST INVENTORY OF CANOPY AND FOREST CARBON STOCKS**

- ▶ National Land Cover Database – 30 m resolution satellite imagery. Current available imagery taken in 2011 and more recent 2016 imagery is being assessed.
  - ▶ Preliminary numbers using this database: 99,994 canopied acres in Dane County, amounting to a canopy cover of ~13% of County land.

Barren Land (Rock/Sand/Clay)
Cultivated Crops
Deciduous Forest
Developed, High Intensity
Developed, Low Intensity
Developed, Medium Intensity
Developed, Open Space
Emergent Herbaceous Wetlands
Evergreen Forest
Grassland/Herbaceous
Mixed Forest
Open Water
Pasture/Hay
Perennial Ice/Snow
Shrub/Scrub
Woody Wetlands



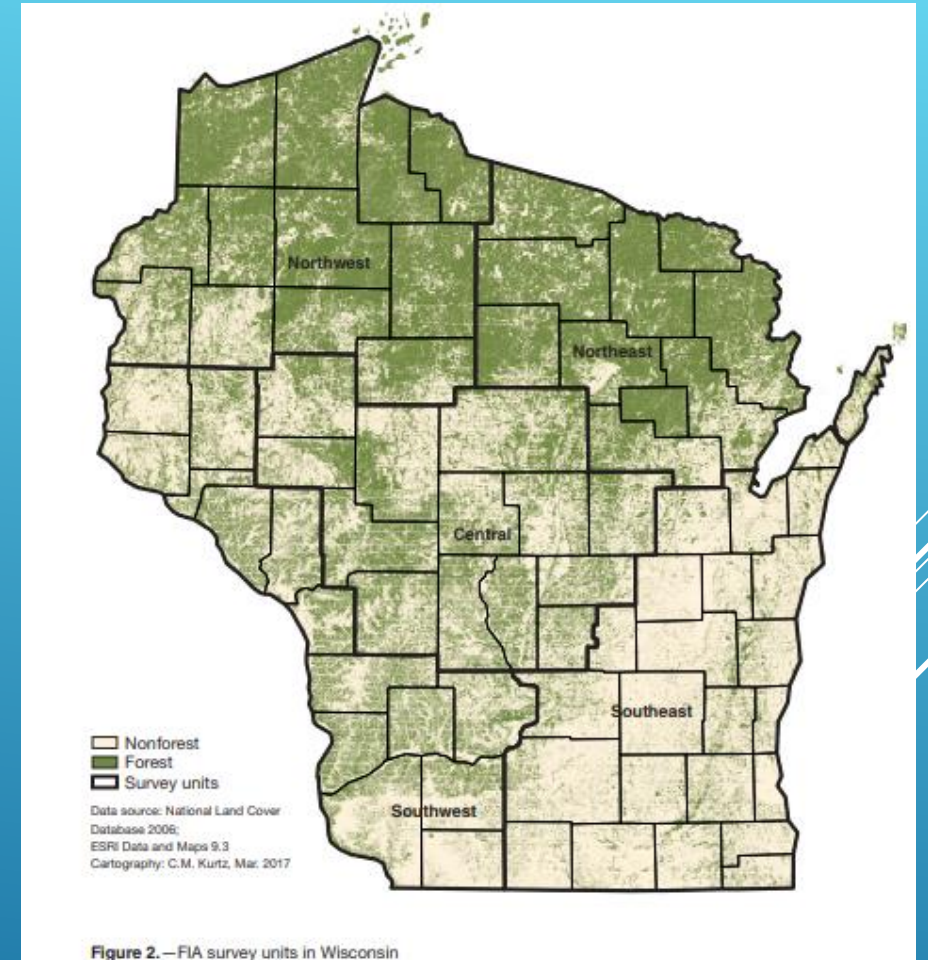
Land Use	Acreage	Percent
Developed, High Intensity	6,221.50	0.79
Developed, Medium Intensity	19,946.90	2.52
Developed, Low Intensity	50,183.10	6.33
Developed, Open Space	42,271.10	5.33
Deciduous Forest	104,144.80	13.14
Evergreen Forest	2,033.90	0.26
Mixed Forest	826.4	0.1
Shrubland	7,269.40	0.92
Grassland/Herbaceous	4,987.80	0.63
Pasture/Hay	144,708.60	18.26
Cultivated Crops	349,539.80	44.11
Barren Land	724.7	0.09
Herbaceous Wetland	25,159.50	3.17
Forested Wetland	9,187.80	1.16
Open Water	25,269.60	3.19

# SAMPLE CANOPY BASELINE

Establish Baseline

▶ **Dane County forestland data, derived from the Forest Inventory and Analysis project, the USFS's "forest census", which has 6,400 forested plots across the state**

- ▶ 41,754 acres of forestland in Dane County
  - ▶ 40,216,265 trees over 1 inch diameter
  - ▶ 2,967,265 short tons of carbon in above and below ground tree biomass
  - ▶ 9,574,110 short tons of carbon on forestland (soils, live trees, dead trees, etc.)



# SAMPLE FIELD INVENTORY BASELINE

Establish Baseline



- ▶ 1) Keep Forests as Forests
- ▶ 2) Create New Forests Through Afforestation
- ▶ 3) Increase the Use of Forest Products

**ONCE A BASELINE IS ESTABLISHED,  
3 POSSIBLE MANAGEMENT STRATEGIES**

**Management Strategies**



## ▶ Action Items:

- ▶ A) Encourage land use planning that includes maintaining existing forest canopy. Identify key parcels of land that support county acquisition goals and acquire key parcels that maintain forest for carbon and the variety of public benefits for these lands.
  - ▶ Conservation easements and conservation subdivisions should be encouraged.
- ▶ B) Manage current publicly owned forests in urban and rural areas to maintain health and resilience.
- ▶ C) Explore developing a county based “managed forest law” in Dane County for privately owned forests encouraging, sustaining or possibly increasing the amount of forest canopy on private lands.
- ▶ D) Develop options for municipalities to maintain or grow trees on private properties (e.g. through ordinances, fees, subsidies, tax benefits).

# 1) KEEP FORESTS AS FORESTS

▶ **Action Items:**

- ▶ A) Apply to NRCS for funds to establish a new grant program for municipalities to plant and inventory urban forests.
- ▶ B) Identify potential areas for planting new forests.
  - ▶ Note: can use land cover data to determine “plantable” areas (e.g. those areas covered by herbaceous plants)
  - ▶ Note: i-Tree Planting can be used to estimate long-term benefits of a tree planting project

## 2) CREATE NEW FORESTS THROUGH AFFORESTATION

▶ **Action Items:**

- ▶ A) Increase use of forest products to extend carbon storage and replace other fossil fuel intensive products.
  - ▶ Note: [i-Tree Harvest Carbon Calculator](#) can be used to estimate carbon stored in harvested wood products
- ▶ B) Utilize wood from publicly owned urban and rural forests to encourage long-term forest products that sequester carbon.

## **3) INCREASE THE USE OF FOREST PRODUCTS – KEEP CARBON IN WOOD**

▶ **Reassess programs:**

- ▶ Reassess change in carbon stocks over time, monitoring selected forest management strategies.
- ▶ Pursue additional canopy assessments to gauge the success of reforestation and afforestation programs and changes in carbon sequestration.

**TRACK PROGRESS**



## ▶ Carbon sinks

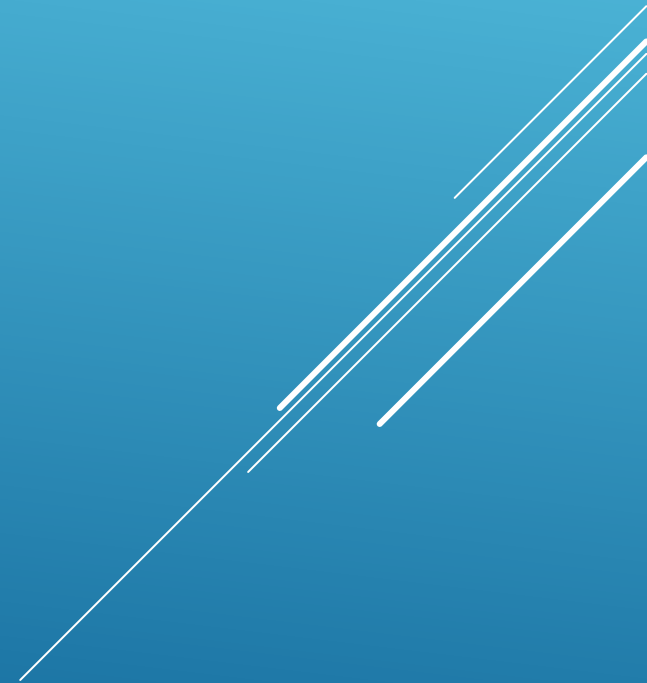
- ▶ Land Use is the most important sector in the United States for removing carbon from the atmosphere, offsetting 11.6% of emissions
- ▶ **Forest land remaining forest land** accounted for **77%** of the carbon removal capacity of land use in 2016, **land converted to forests** accounted for **8.6%** and **urban sequestration** (urban forests, grasslands, etc.) accounted for **11.9%**

## ▶ Three Management Strategies

- ▶ Keep Forests as Forests
- ▶ Create New Forests Through Afforestation
- ▶ Increase the Use of Forest Products

# IN SUMMARY

HEALTHY SOIL FOR  
FOOD SECURITY AND THE CLIMATE



- ▶ Land Use, Land-Use Change and Forestry's carbon contributions

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U.S. Environmental Protection Agency, 2018

# CARBON SINKS IN THE UNITED STATES

# CURRENT DANE COUNTY FARM PRACTICES



Dane County farmers are using federal and county cost share dollars to plant vegetative buffer strips along streams to retain soil and protect water quality, use low-till to conserve soil and use nutrient management plans to apply manure nutrients and chemical fertilizer more economically and efficiently to protect water quality. Photo by DC LWR Department



- ▶ The Next step is to focus on Healthy Soils
- ▶ and NO bare ground

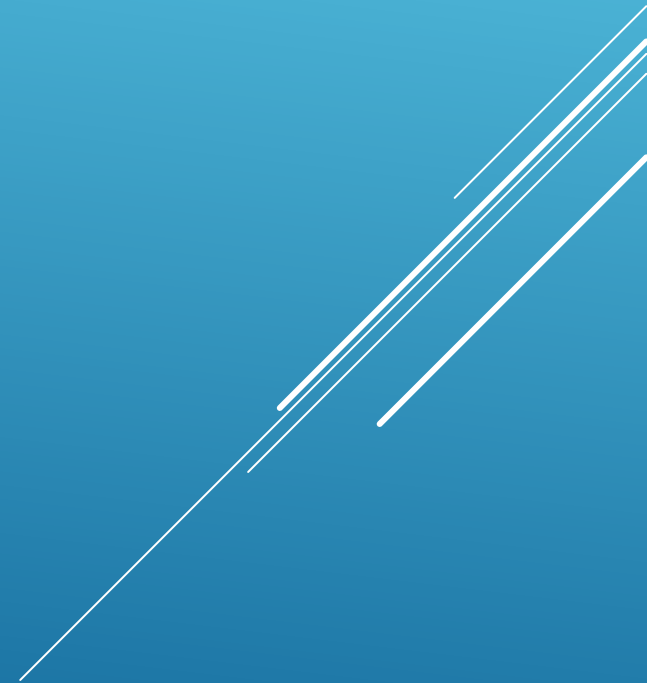
THE NEXT STEP

A decorative graphic consisting of several parallel white lines of varying lengths, slanted upwards from left to right, located in the bottom right corner of the slide.

*Soil Health* is defined by US Dept. of Agriculture  
Natural Resources Conservation Service as

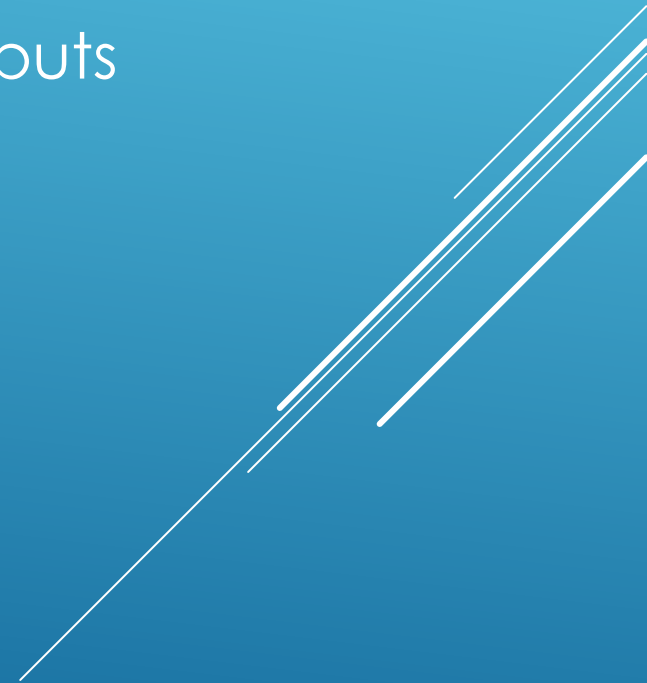
*the continued capacity of soil to  
function as a vital living ecosystem that  
sustains plants, animals, and humans.*

“HEALTHY SOIL FOR LIFE”  
USDA NRCS



- ▶ Increased Carbon Capture in plants and soil
- ▶ Diversify marketable crops to feed people & livestock
- ▶ Build soil health, fertility and resilience to extremes of climate
- ▶ Reduce fossil fuel inputs

COUNCIL WILL DEMONSTRATE  
AGRICULTURAL SOILS PLAY  
A CRUCIAL ROLE



- ▶ Demonstrate NRCS agroforestry and regenerative practices
- ▶ Assist local partners to transition portions or whole conventionally farmed fields
- ▶ Track inputs and real world experiences
- ▶ Outreach efforts to farmers and consumers

PROPOSALS FOR COUNCIL





Agroforestry is the intentional growing of trees and shrubs in combination with crops or forage.

Co-Benefits:

- ▶ Create habitat for wildlife and increase landscape diversity
- ▶ Windbreaks for crops
- ▶ Shade for livestock
- ▶ Conserve soil and water resources
- ▶ Provide woody plant products – timber, pulpwood, posts, fruit, nuts
- ▶ In addition to agricultural crops or forage.

# NRCS AGROFORESTY

- ▶ Windbreaks

- ▶ Riparian buffers

- ▶ Alley cropping

- ▶ Silvopasture

- ▶ Forest farming also called  
Multi-story cropping

## **NRCS AGROFORESTRY PRACTICES**

- ▶ Single or multiple rows of trees and shrubs in linear configurations that protect areas from wind.
- ▶ NRCS photo



## WINDBREAKS

- ▶ A corridor of trees and/or shrubs planted adjacent to a river, stream, wetland or water body. The planting is of sufficient width and upgradient and near the water body to insure adequate functioning for the desired purpose. NRCS photo



# RIPARIAN BUFFERS

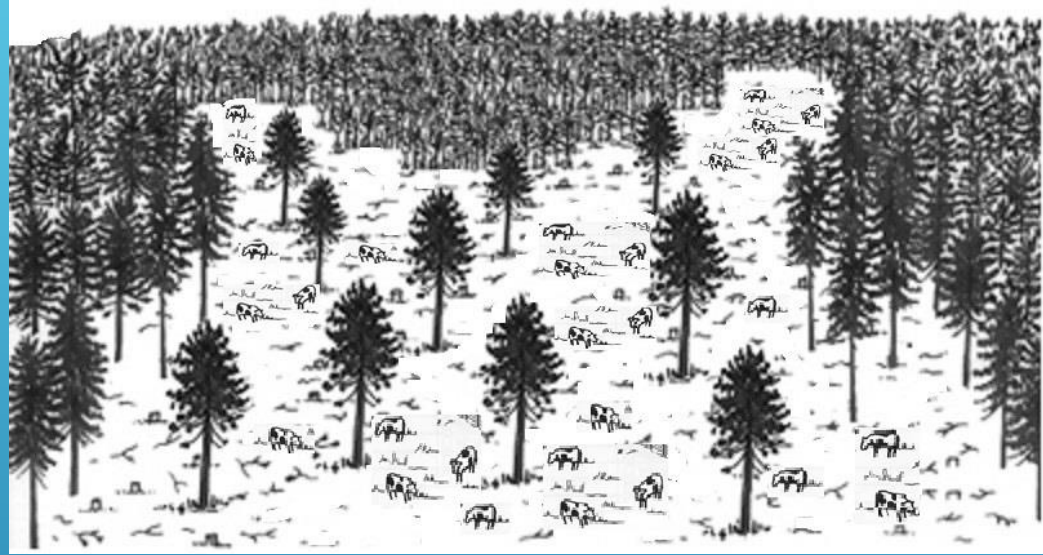


- ▶ An agricultural crop is grown simultaneously with a long-term tree crop to provide annual income while the tree crop matures



## ALLEY CROPPING

- ▶ Establishment of high value timber with livestock forages on the same acres.



SILVOPASTURE

- ▶ Forest farming or Multi-Crop farming is the cultivation of high-value specialty crops under the protection of a forest canopy that has been modified to provide the correct shade level.
- ▶ Crops like ginseng, shiitake mushrooms, and decorative ferns are sold for medicinal, culinary, and ornamental uses. Forest farming provides income while high-quality trees are being grown for wood products. NRCS photo



## FOREST FARMING OR MULTI-CROP FARMING

- ▶ Friends Of Silverwood Farm Park
- ▶ Other Dane County Parks with agricultural lands and mission
- ▶ Farms participating in NRCS programs
- ▶ CSAs -- Community Supported Agriculture farms
- ▶ UW Extension
- ▶ UW Center for Integrated Agricultural Systems
- ▶ Municipal Parks
- ▶ Organizations encouraging community-based food production, edible landscapes or pollinator programs
- ▶ Dane County, Madison and other Food Policy Councils

POTENTIAL LOCAL PARTNERS



- ▶ Savanna Institute
- ▶ The Land Institute
- ▶ USDA NRCS
- ▶ 4 Per 1000, the International soil sequestration initiative launched December 2015 in France.

POTENTIAL R&D PARTNERS



- ▶ **NRCS Grants with Matches by Dane County and Partner Organizations**
- ▶ **Demonstration Sites will need:**
  - ▶ **Baseline inventories**
  - ▶ **Tracking inputs**
  - ▶ **Field edge monitoring**
  - ▶ **Document real world experiences**
- ▶ **Field Days at Demonstration Sites**
- ▶ **Tour The New Forest Farm in Viola WI**
- ▶ **Beginning farmer programs with technical and financial support**

**OUTREACH TO FARMERS AND  
NON-PROFIT ORGANIZATIONS**

- ▶ Green House Gas Emissions - (neutral)
  - ▶ Agriculture and Forestry land use not expected to increase or decrease emissions
- ▶ Carbon Sequestration (positive impact)
  - ▶ Increased land use in Agriculture and Forestry will increase Carbon Sequestration
- ▶ Project Cost (neutral)
  - ▶ Certainly costs will occur from a county investment to manage these programs however, the opportunity to mitigate climate change is significant with Agriculture and Forestry land use.

**CRITERIA BENEFITS** 1 OF 3

- ▶ Feasibility (positive)
  - ▶ Many partners and high interest among beginning farmers and non-profit organizations, technically feasible, politically feasible, feasible land availability
- ▶ Economic Benefits (positive)
  - ▶ Creates local jobs, new locally-grown wood products and diversity of locally-grown food products, increased individual farmer resilience against changes in federal subsidized agriculture, increased fertility
- ▶ Temporal Dimensions (positive)
  - ▶ Immediate small increases in carbon sequestration and soil fertility which will grow substantially over time. Forests and permanent crop cover do not require annual replacement

## CRITERIA BENEFITS 2 OF 3



- ▶ Equity Considerations (positive)
  - ▶ Opportunities for beginning farmers, current small farmers and CSA operations; increased local food security, creates jobs, and creates value-added production and markets, increased local community resilience: Great opportunity for establishing urban and rural forests
- ▶ Health (positive)
  - ▶ Benefits increased locally-grown foods, temperature reduction of soil and air for humans, livestock and micro-organisms, protects ground and surface waters, resilience to extremes of climate, Urban and rural forests provide habitat for wildlife and a variety of other ecosystem services of clean water and the spiritual values of trees.
- ▶ Adaptation (positive)
  - ▶ Agriculture and Forestry land use allows increase resiliency and adaptation opportunity

QUESTIONS? COMMENTS?

The image features a solid blue background with a gradient from light blue at the top to a darker blue at the bottom. In the bottom right corner, there are several white, parallel diagonal lines of varying lengths, creating a sense of motion or a modern design element.