NYLCVEF
EDUCATING FOR THE ENVIRONMENT

SABIN CENTER FOR CLIMATE CHANGE LAW

Welcome to our 4th virtual roundtable in our series on implementing the Climate Leadership and Community Protection Act

Protection & Management of New York's Natural Resources

January 14th, 2021
10:00 am - 12:00 pm

Sponsored By:

conEdison

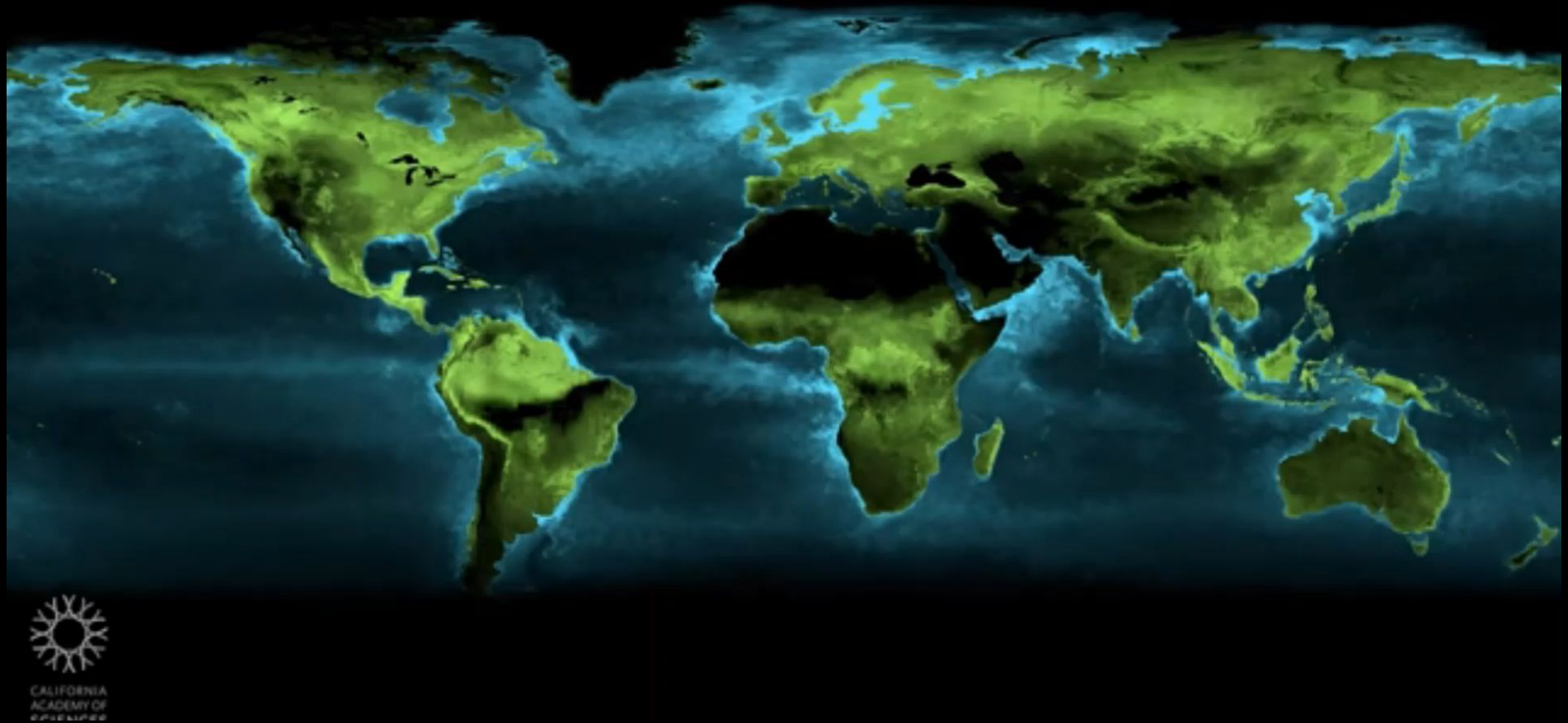
How does managing nature help with climate mitigation and adaptation?

Shahid Naeem

Dept. of Ecology, Evolution, and Environmental Biology

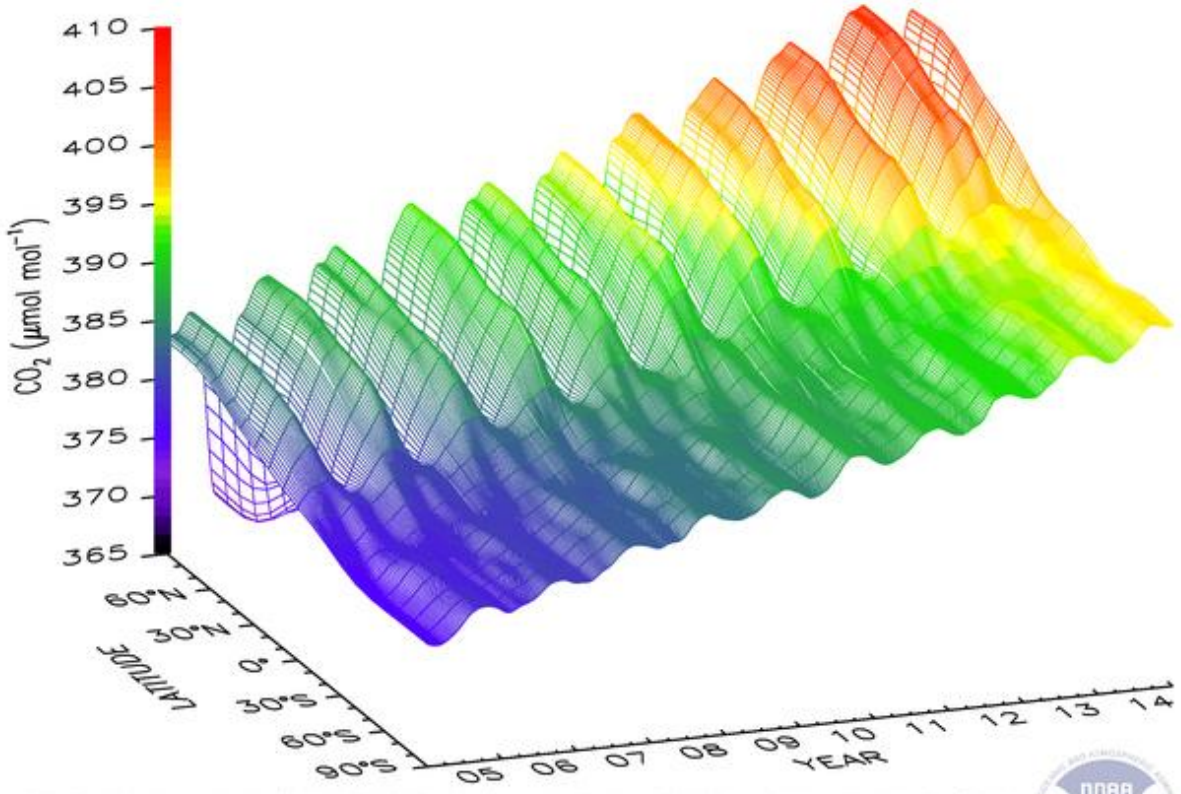
Columbia University

14 January 2020


CALIFORNIA
ACADEMY OF

Global Distribution of Atmospheric Carbon Dioxide

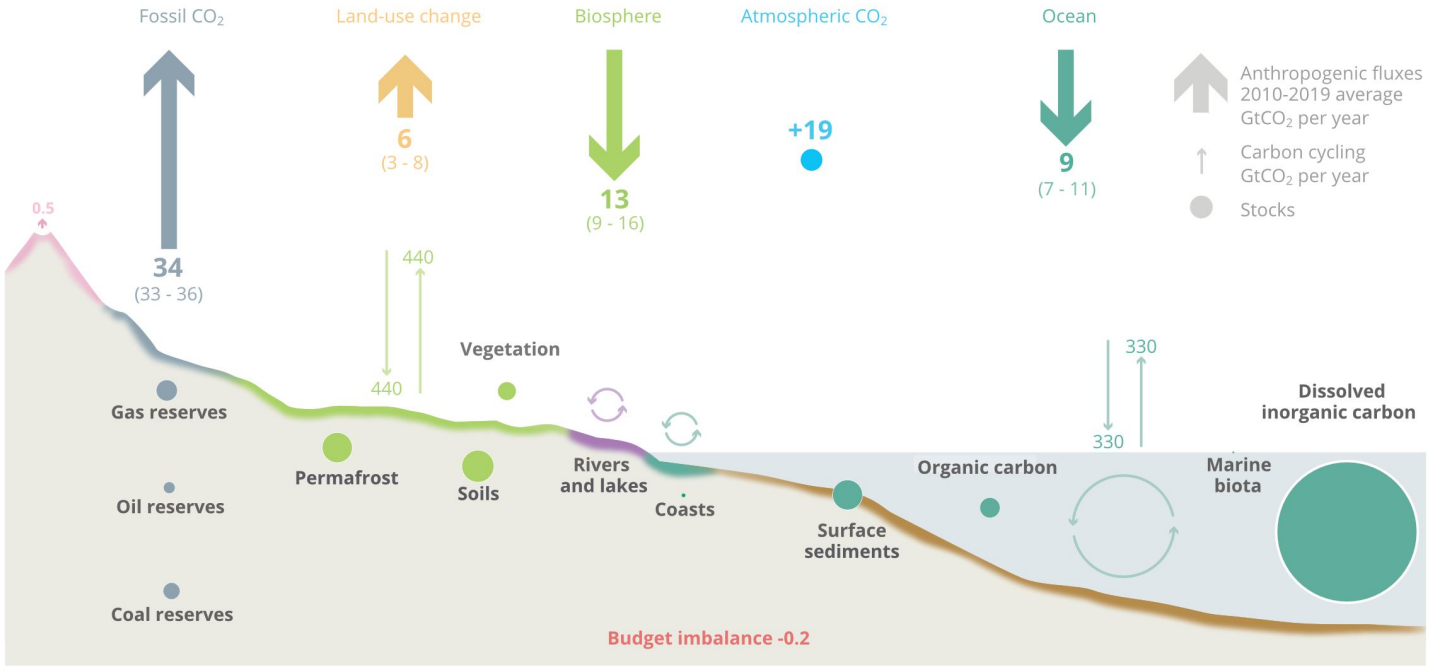
NOAA ESRL Carbon Cycle



Three-dimensional representation of the latitudinal distribution of atmospheric carbon dioxide in the marine boundary layer. Data from the Carbon Cycle cooperative air sampling network were used. The surface represents data smoothed in time and latitude. Contact: Dr. Pieter Tans and Dr. Ed Dlugokencky, NOAA ESRL Carbon Cycle, Boulder, Colorado, (303) 497-6678, pieter.tans@noaa.gov, http://www.esrl.noaa.gov/gmd/ccgg/.

Anthropogenic perturbation of the global carbon cycle

Perturbation of the global carbon cycle caused by anthropogenic activities, averaged globally for the decade 2010–2019 ($GtCO_2$/yr)



The budget imbalance is the difference between the estimated emissions and sinks.
Source: CDIAC; NOAA-ESRL; Friedlingstein et al 2020; Ciais et al. 2013; Global Carbon Budget 2020

Fate of anthropogenic CO_2 emissions (2010–2019)

Sources = Sinks

34.4 $GtCO_2$/yr

86%

14%

5.7 $GtCO_2$/yr

18.6 $GtCO_2$/yr

46%

31%

12.5 $GtCO_2$/yr

23%

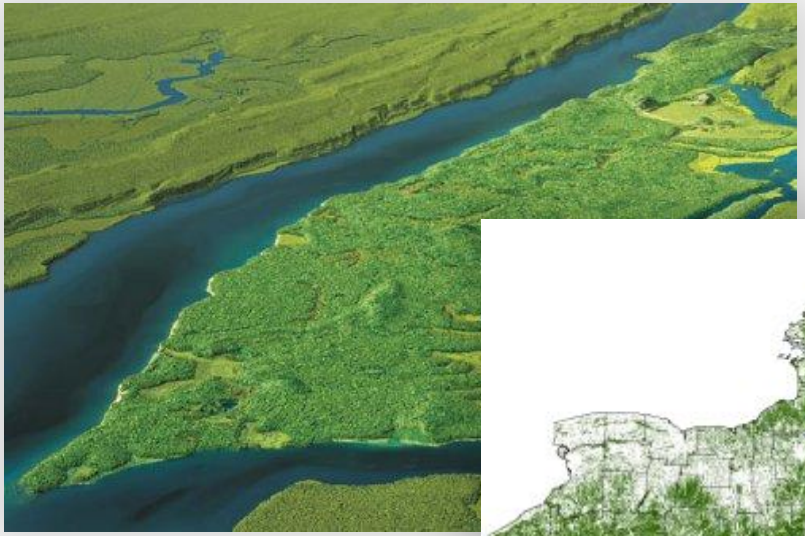
9.2 $GtCO_2$/yr

Budget Imbalance:
(the difference between estimated sources & sinks)

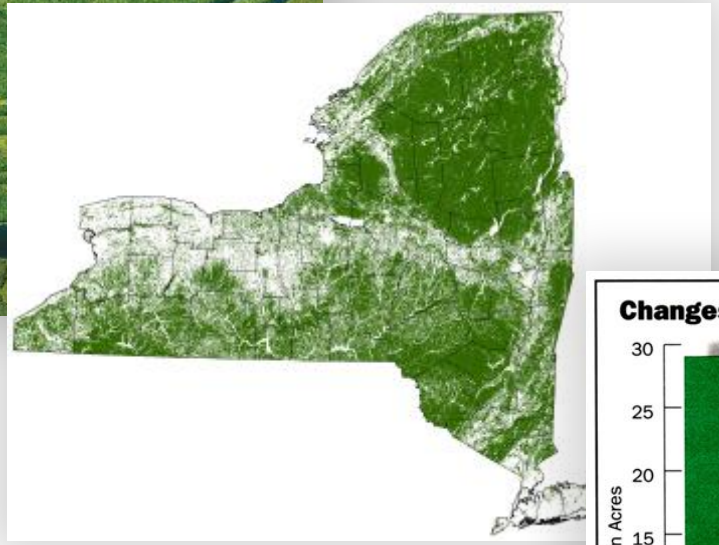
0.4%

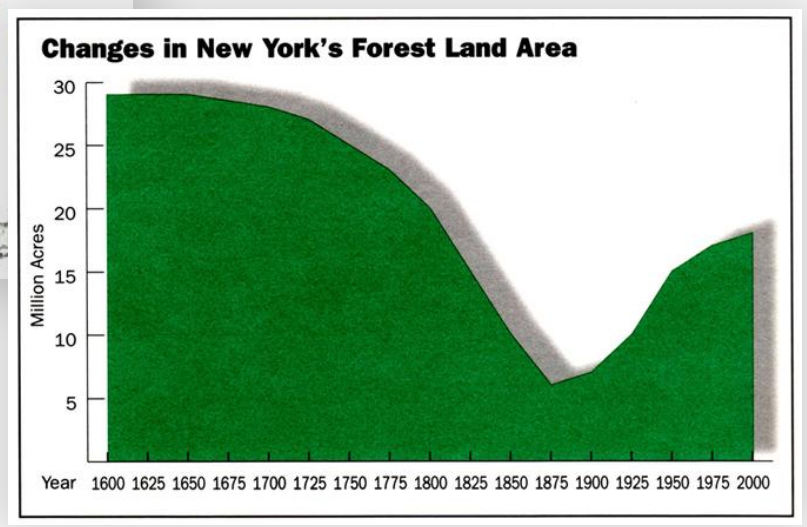
0.2 $GtCO_2$/yr

Source: Friedlingstein et al 2020; Global Carbon Budget 2020



Think globally, act locally.





Managing nature to mitigate and adapt to climate change: A multidimensional endeavor.

- Social engagement
  - **Sam Bishop** – Trees NY
- Management
  - Conservation – driven management
    - **Jessica Ottney Mahar** – Nature Conservancy
  - Use-driven management
    - **John Bartow** - Empire State Forest Products Association

Urban Heat Islands

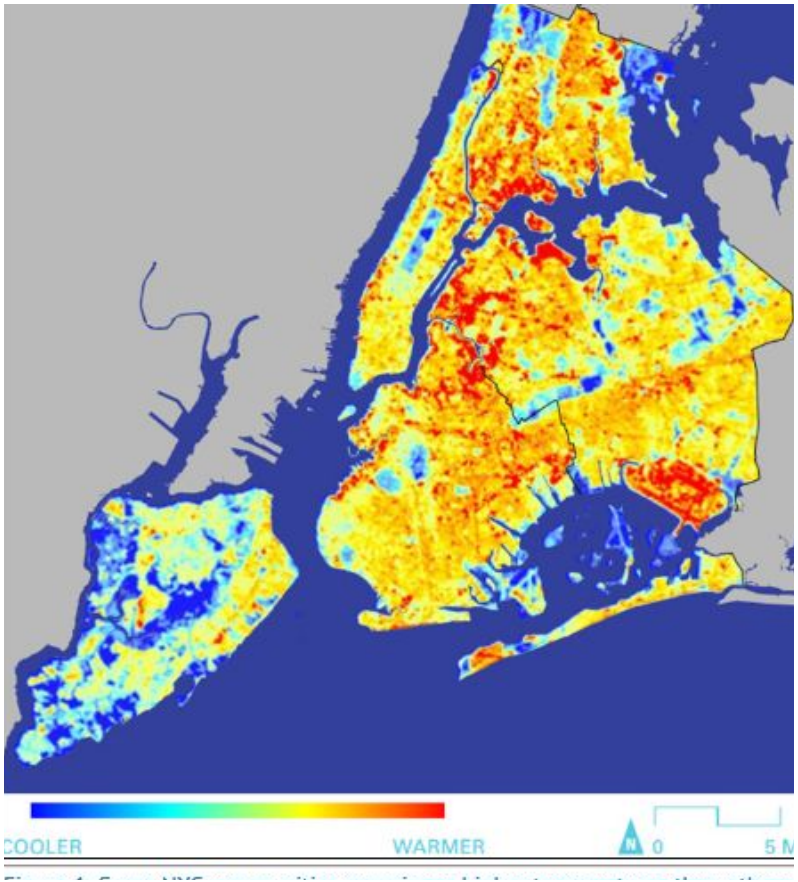
Trees New York
plant preserve protect

Trees New York

Trees New York , a 501 ©(3) nonprofit organization, was founded in 1976 as a volunteer response to city cutbacks in tree-related community service

Our Mission is to plant, preserve and protect New York City's urban forest through education, active citizen participation and advocacy. For over three decades, Trees New York has been at the forefront of environmental advocacy in New York City

What is an urban heat island (UHI)?

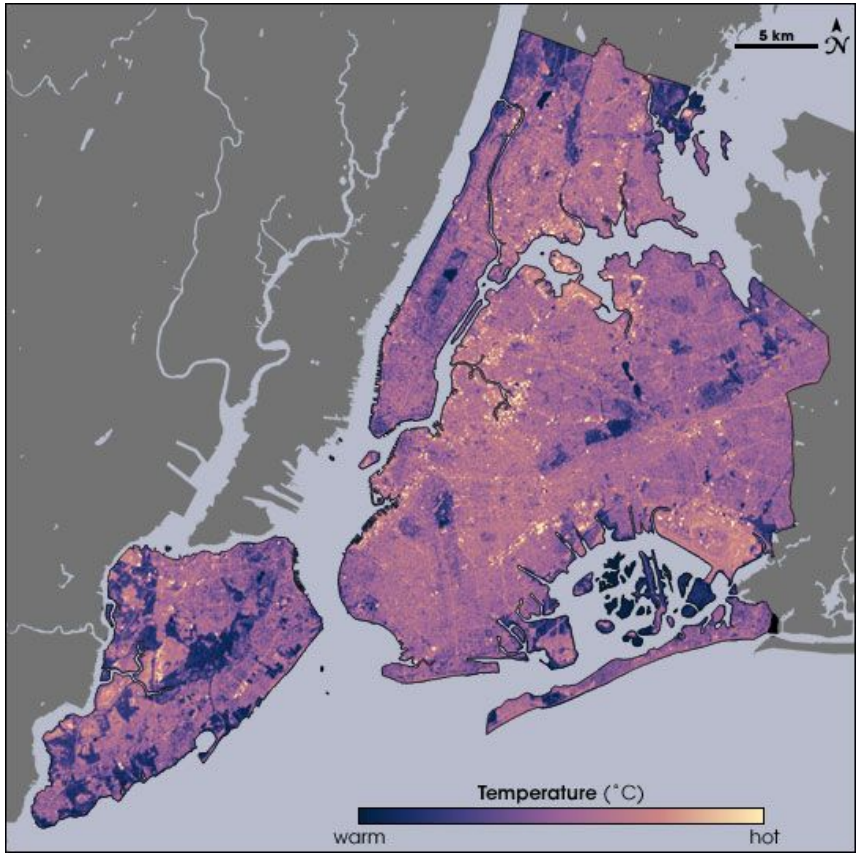


An urban area where temperatures are higher than the surrounding areas due to human activities, including altering the environment.

Urban heat islands were first noted by Luke Howard in 1820 in London.

Image from: https://www1.nyc.gov/assets/orr/pdf/Cool_Neighborhoods_NYC_Report.pdf, based on LANDSAT thermal data 2009

NYC Urban Heat Island and Vegetation

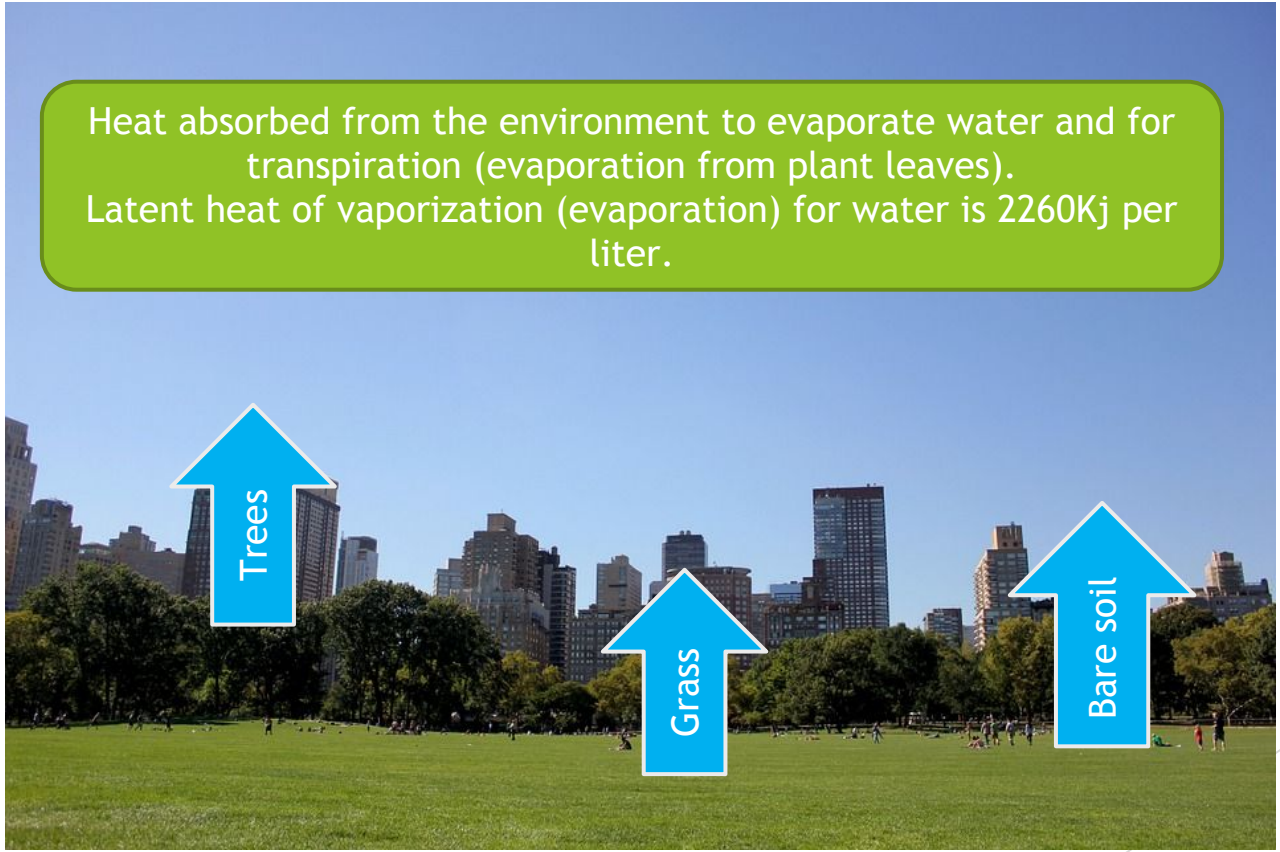


Images from: https://earthobservatory.nasa.gov/features/GreenRoof/greenroof2.php. New York City on August 14, 2002, at 10:30 a.m. (Maps by Robert Simmon, using data from the Landsat Program.)

Shading

Trees shade the sidewalk, street, and possible building walls from warming by the sun. As the tree gets larger, the benefits get larger. This is why the NYC Parks department tries to plant the largest tree possible in a tree bed.

Evapotranspiration



Environmental Justice

- A fair distribution of environmental goods and bads, relying on fair and inclusive outcomes to achieve that outcome, resulting in places where vulnerable people should feel welcome and safe. Rigolon, A., Cities (2018), https://doi.org/10.1016/j.cities.2018.03.016

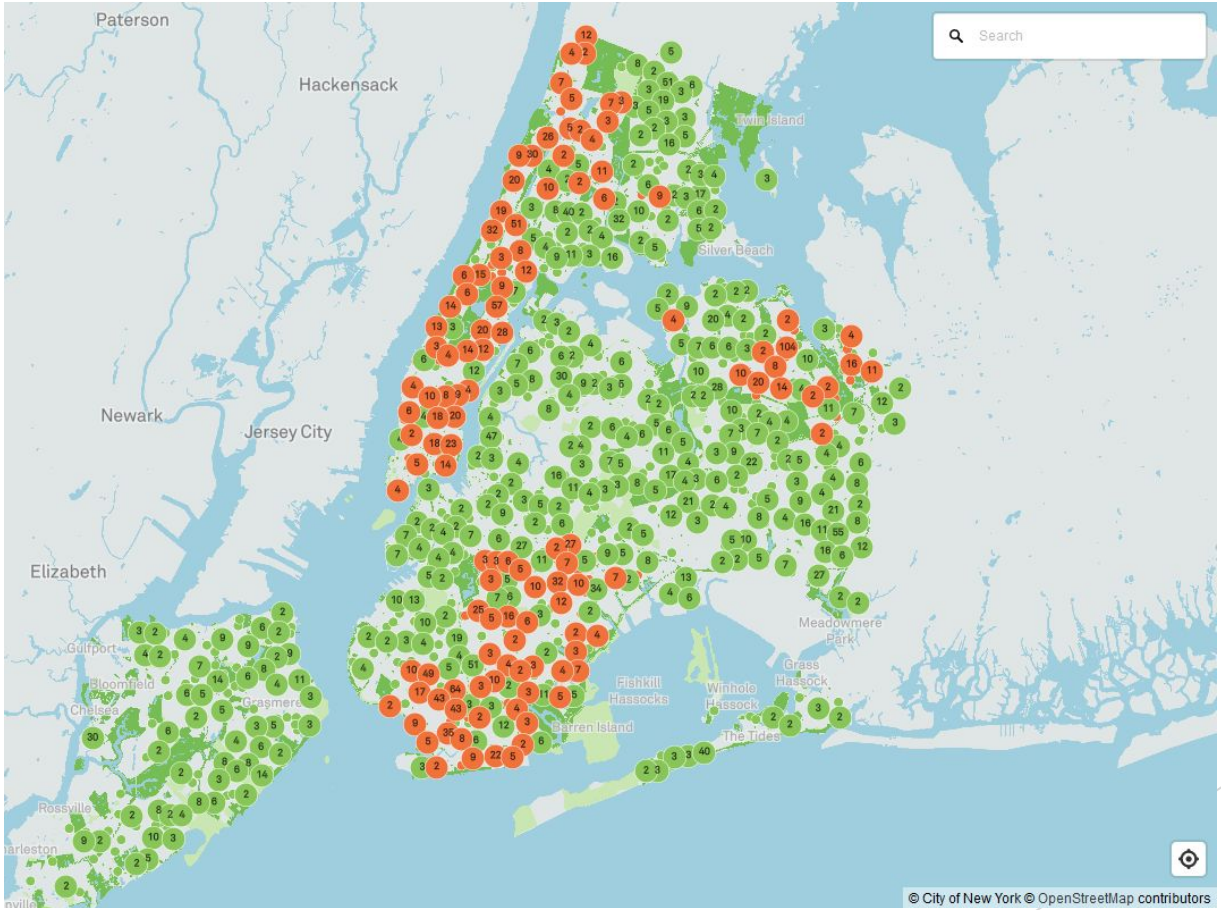
- In many cities around the world, low income neighborhoods have fewer trees and less canopy cover than higher income neighborhoods. De Chant, T. (2012, May 17). Urban trees reveal income inequality.

  Retrieved from http://persquaremile.com/2012/05/17/urban-trees-reveal-income-inequality/

- There is a contrasting problem of environmental gentrification, when environmental improvements and green amenities result in displacement of existing communities.

- Solutions can create new burdens, which must be considered and minimized or eliminated. For example, increasing street tree planting to reduce UHI can force burdens on property owners, like sweeping fallen leaves.

Tree planting locations in NYC



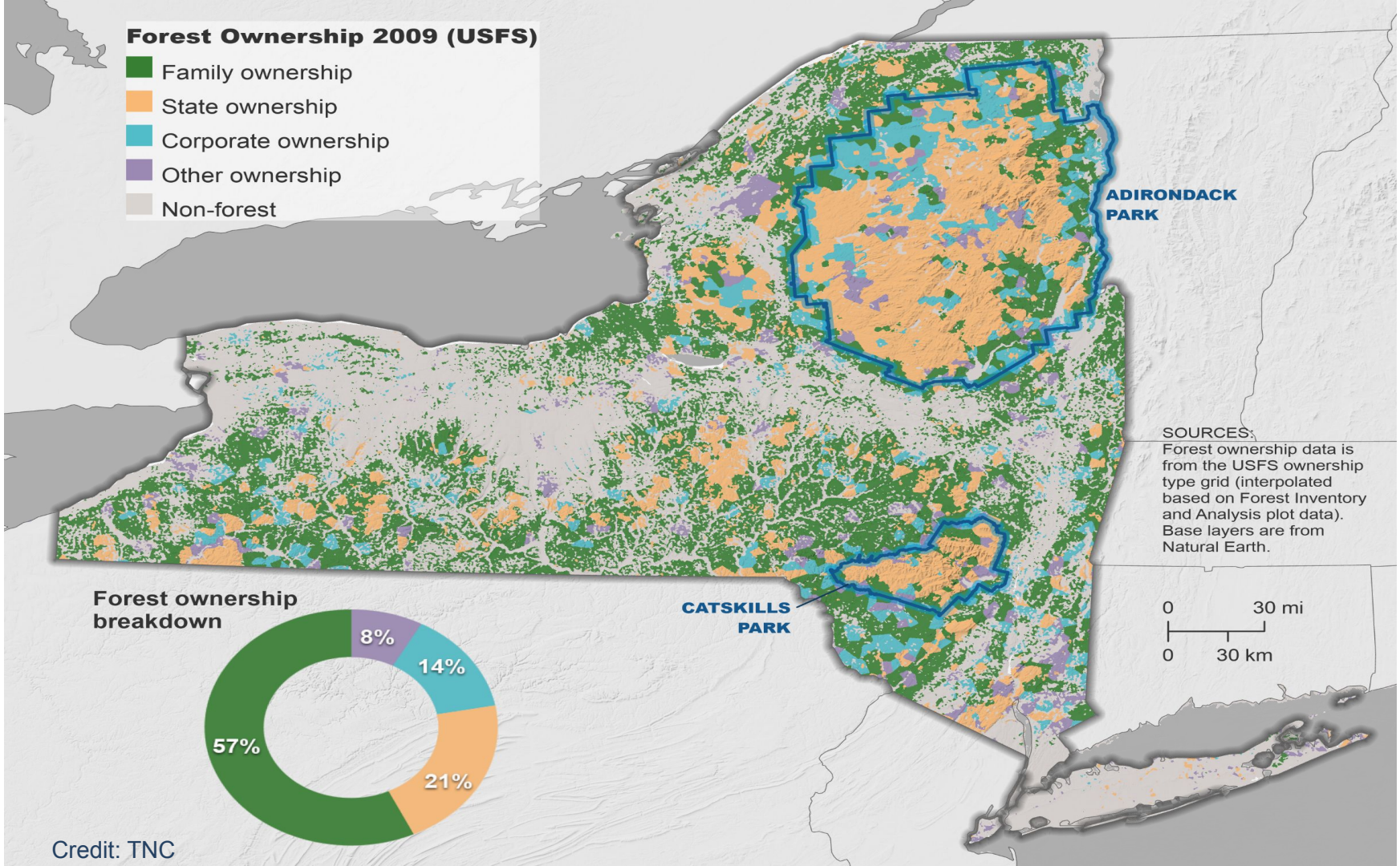
Thank you! Contact: Sam@treesny.org

The Nature Conservancy
New York

NY Forests: Opportunities for Climate Mitigation and Resilience

NYLCV Panel on Natural Climate Solutions, January 14, 2021

Jessica Ottney Mahar, New York Policy & Strategy Director, The Nature Conservancy


Forest Ownership 2009 (USFS)
Family ownership
State ownership
Corporate ownership
Other ownership
Non-forest
ADIRONDACK PARK
CATSKILLS PARK
SOURCES:
Forest ownership data is from the USFS ownership type grid (interpolated based on Forest Inventory and Analysis plot data). Base layers are from Natural Earth.
0 30 mi
0 30 km
Forest ownership breakdown
8%
14%
57%
21%
Credit: TNC

Meeting our Goals

2030 – 30 MMT of net annual CO2e sequestered on forested lands

2050 – 60 MMT of net annual CO2e sequestered across all land types

Credit: TNC

Credit: U.S. Climate Alliance

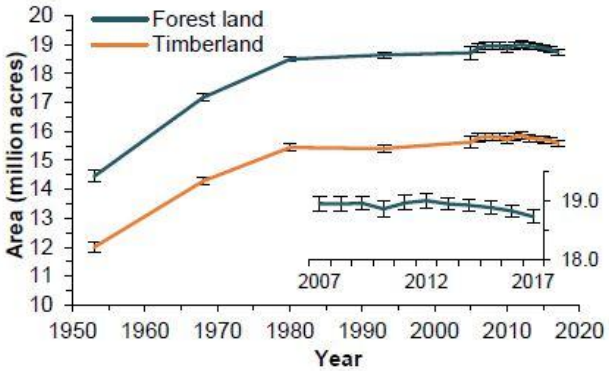
Protect Opportunities – Avoided Conversion

Forest land acreage had been stable for nearly four decades, prior to the 2017 FIA survey

Between 2012 - 2017, approximately 1.7% of forest lands were lost

A majority of forest land was converted to farmland

Forest loss trends are continuing



Credit: USFS FIA report, 2017

Protect Opportunities – Ongoing Research

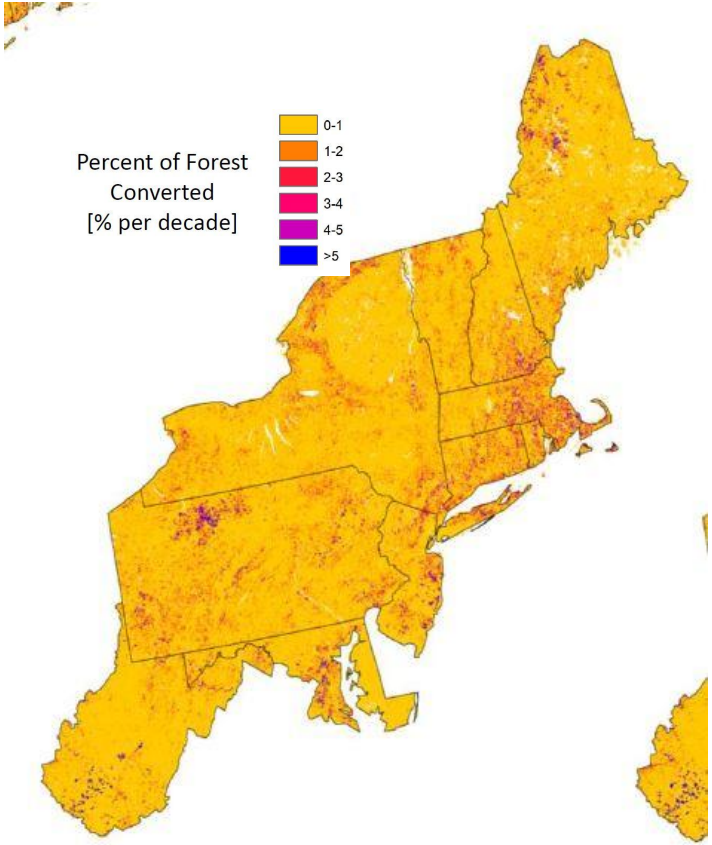
Products

High resolution maps representing historic, current, and future forest loss (1990 – 2050)

Emissions and foregone sequestration estimates associated with forest conversion, including future development scenarios

High resolution carbon storage map representing current and future carbon storage (2000 – 2050)

High resolution carbon sequestration map representing current and future carbon sequestration (2000 – 2050)



Credit: Chris Williams, Clark University

2000 - 2010

Management Opportunities

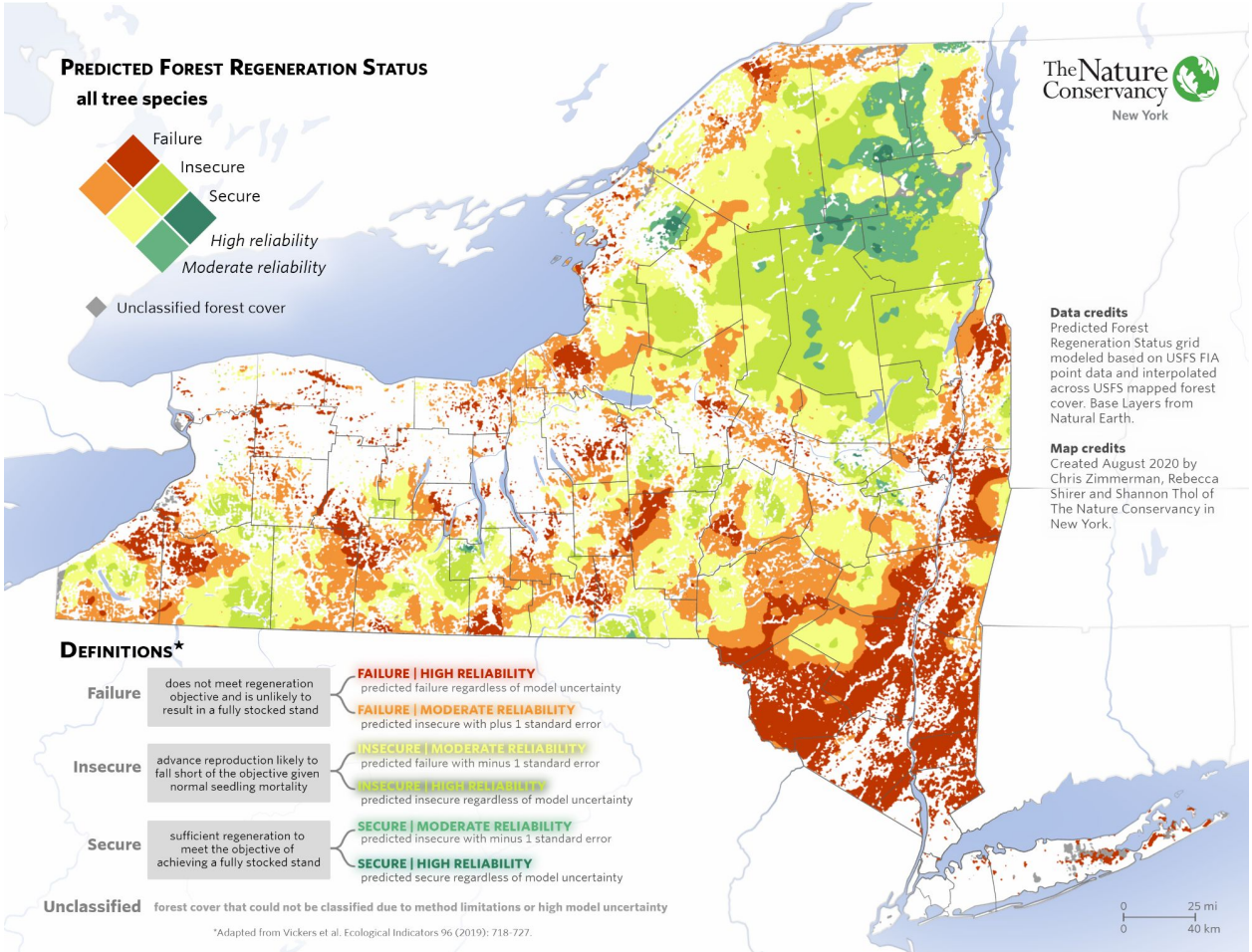
Multi-objective forest management

Harvested wood product substitution

Forestry through foresters

Innovation!

Threat Considerations



Moving forward: Considerations

Identify solutions that meet the needs of the full range of forest landowners

Consider strategies that increase carbon storage and sequestration

Consider co-benefits and other state goals

Consider strategies that both mitigate carbon and build resilience into our forests

Identify and fill data gaps

Consider a full suite of solutions across the whole carbon cycle – forest ecosystems and harvested wood products

Moving forward: Recommendations

Protect – Keep forests as forests, mitigate unavoidable losses

- Develop incentives/regulations to avoid conversion of forest
- Focus funding for open space protection in places with high risk of carbon loss
- Reduce barriers to landowner enrollment in tax relief programs
- Explore new ways to help landowners keep their forests as forests

Manage – Increase the productivity and resilience of forestlands

- Explore financial solutions to help landowners maintain and improve their forests
- Address issues limiting the regeneration of NY's forests, such as, deer, invasive species, and management practices
- Address forest pest and pathogen impacts
- Increase the use of consulting foresters and forest management plans
- Increase the proportion of harvest directed to durable wood products

Restore – Promote the establishment of new and restored forests

- Expand the use of existing reforestation programs
- Explore new ways to significantly scale up reforestation
- Increase urban forest canopy and open space

Moving forward: Funding

NYS Environmental Protection Fund (EPF)

- $300M/year
- Land conservation (fee, easement, municipal, land trust, parks); Urban Forestry, Resilience Planting Program

NYS Water Infrastructure Improvement Act

- $110M Source Water Protection Program

NYS Environmental Bond Act: $3 billion

- Restoration & Flood Risk Reduction (at least $1 billion)
- Climate Change Mitigation (at least $700 million)
- Water Quality & Resilient Infrastructure (at least $550 million)
- Open Space Conservation & Recreation (at least $550 million)

NYS Forest Tax Law

- Real Property Tax Law sections 480/480a
- 75% NYS forests privately owned. Aging and moderate income. Vulnerable to property taxes driving conversion.

Federal Programs

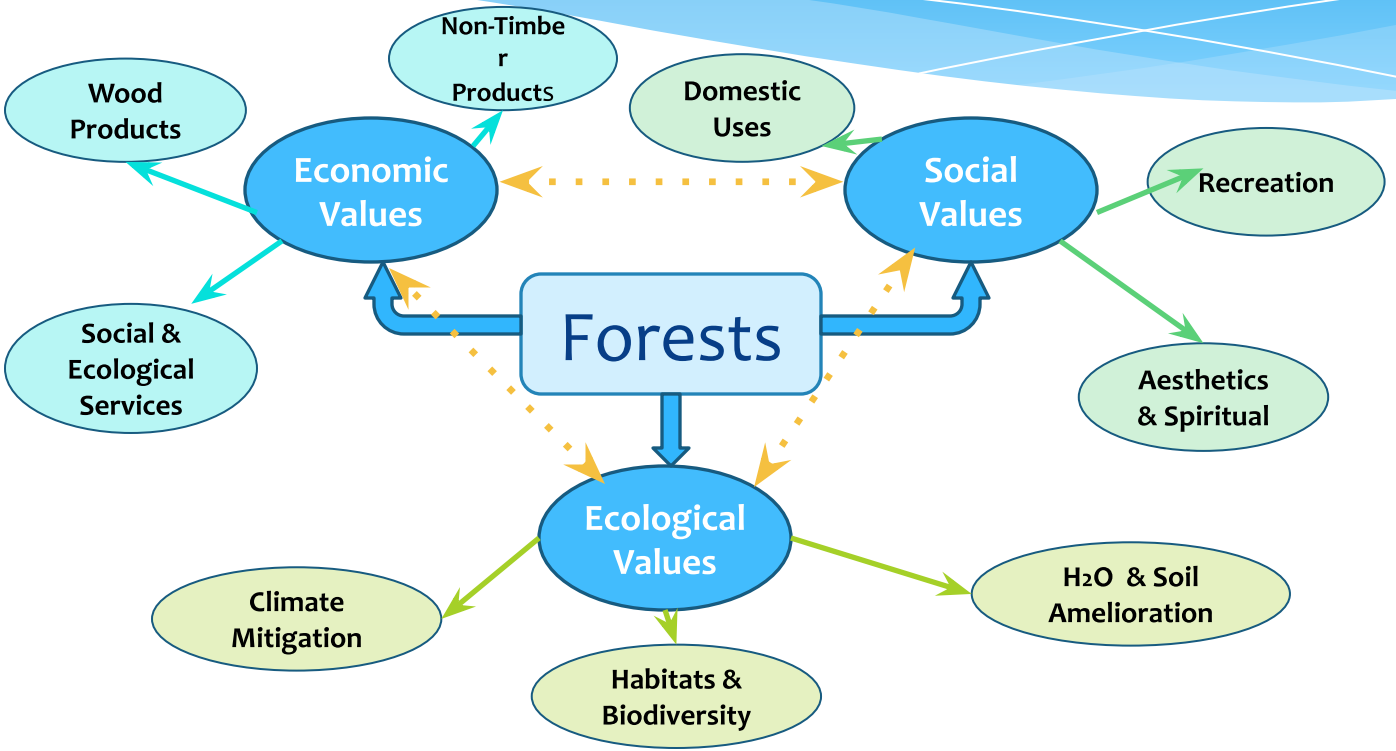
- Land and Water Conservation Fund, Forest Legacy
- Farm Bill programs

NEW YORKERS
for Clean Water & Jobs
CLEANWATERANDJOBS.ORG

Forests and Wood Products Sector of New York: Role in Climate Change Solutions

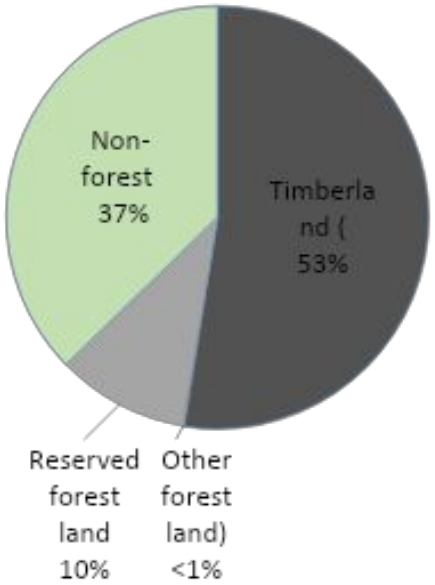
John Bartow
Executive Director
Empire State Forest Products Association
New York League of Conservation Voters
January 14, 2021

Importance and Benefits from Forests:



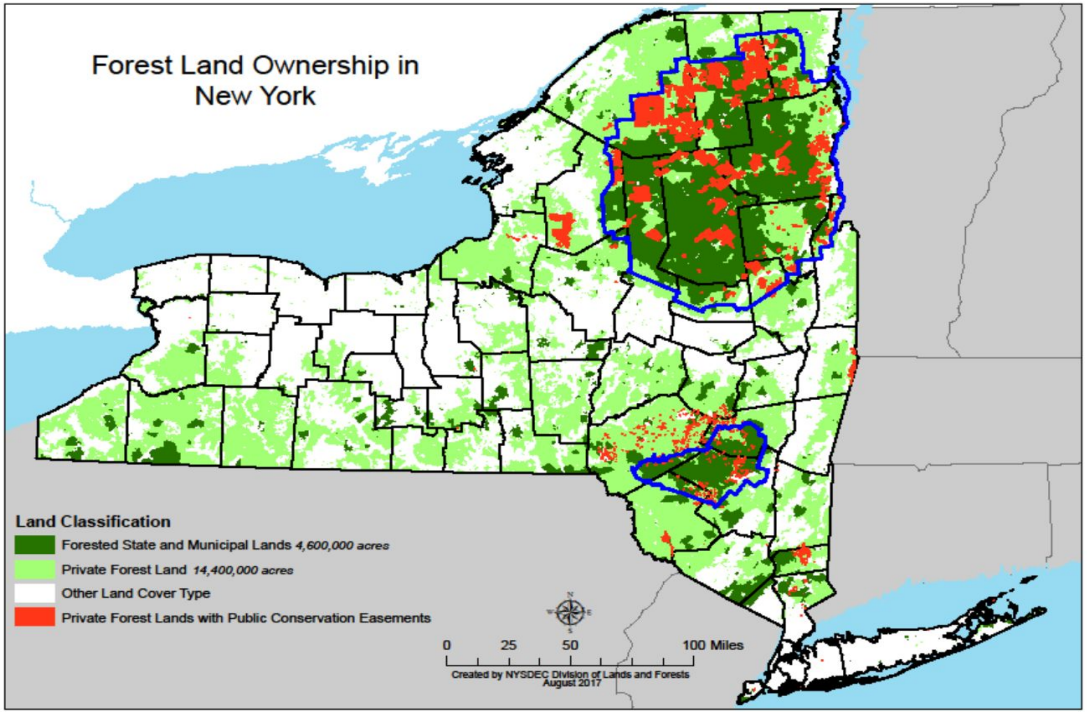
State of New York's Forest: Extensive

Total forest land = 18,622,212 acres 63%

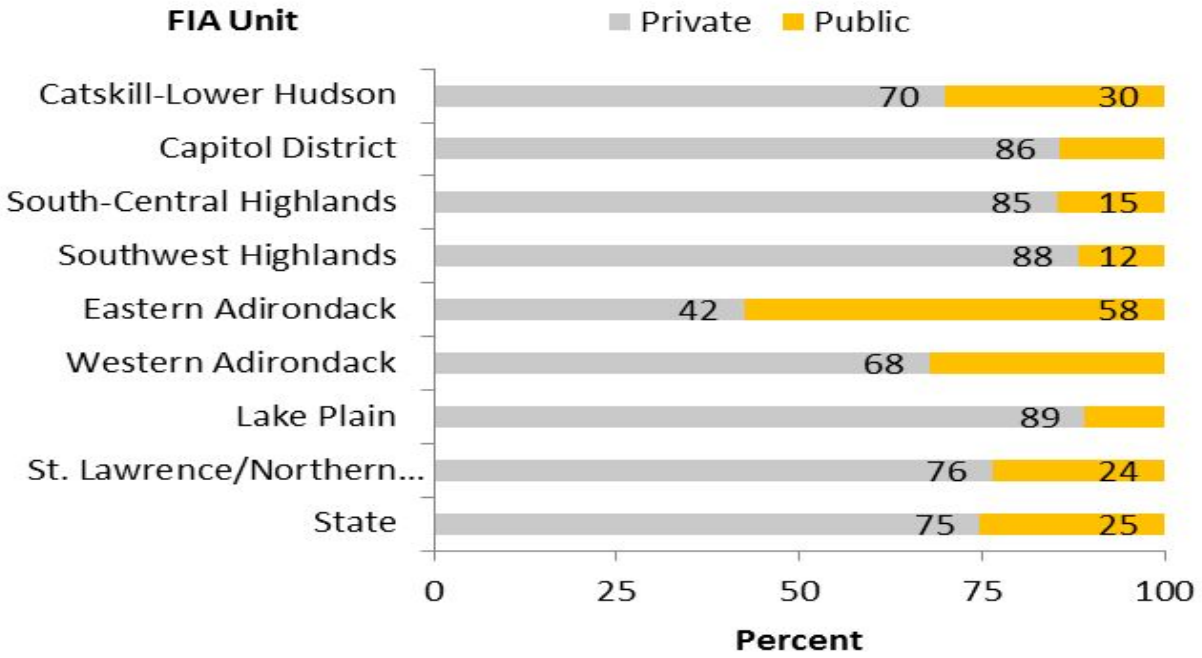


State of New York's Forest - Extensive

Forestland by Public vs. Private Ownership



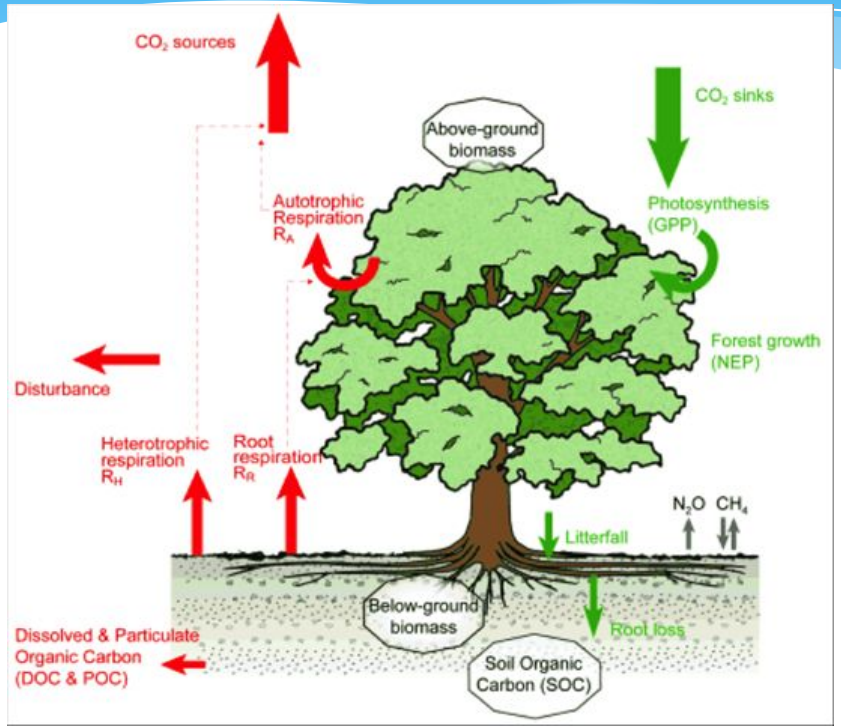
State of New York's Forest: Private



State of New York Forests: Economic

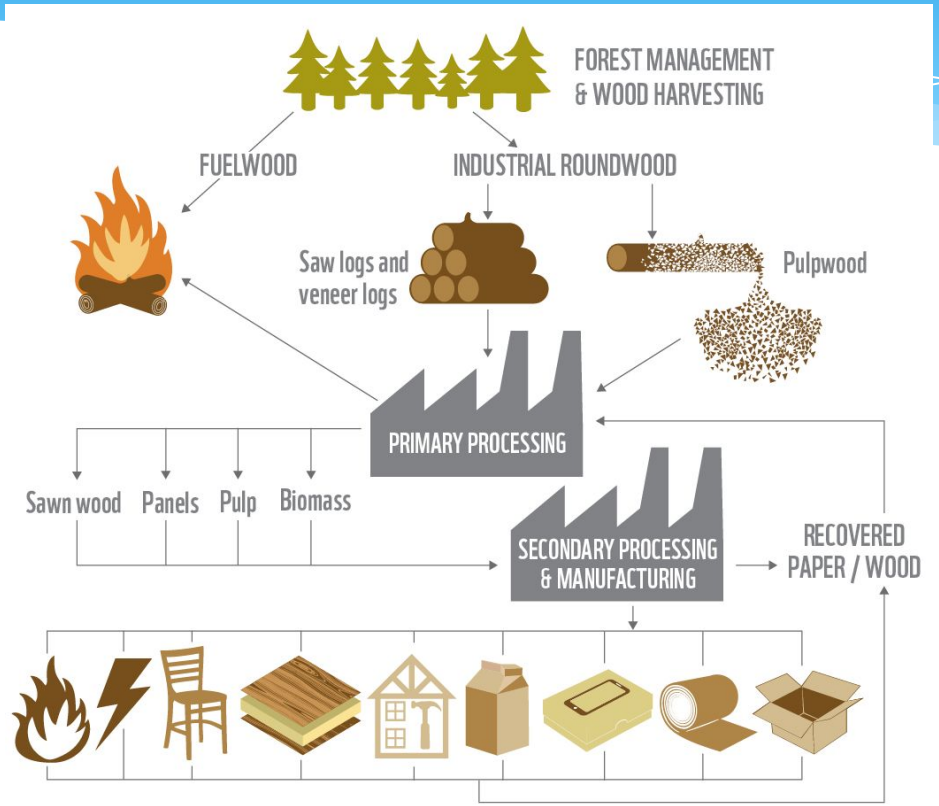
* **$22.9 billion Total Statewide Economic Impact:**
  * $13.1 billion in Direct output
  * $6.4 billion on Indirect output
  * $3.4 in Induced output
* **Nearly 100,000 jobs statewide**
  * $61,526 average labor income per worker
* **$300 million in annual payments to private landowners**

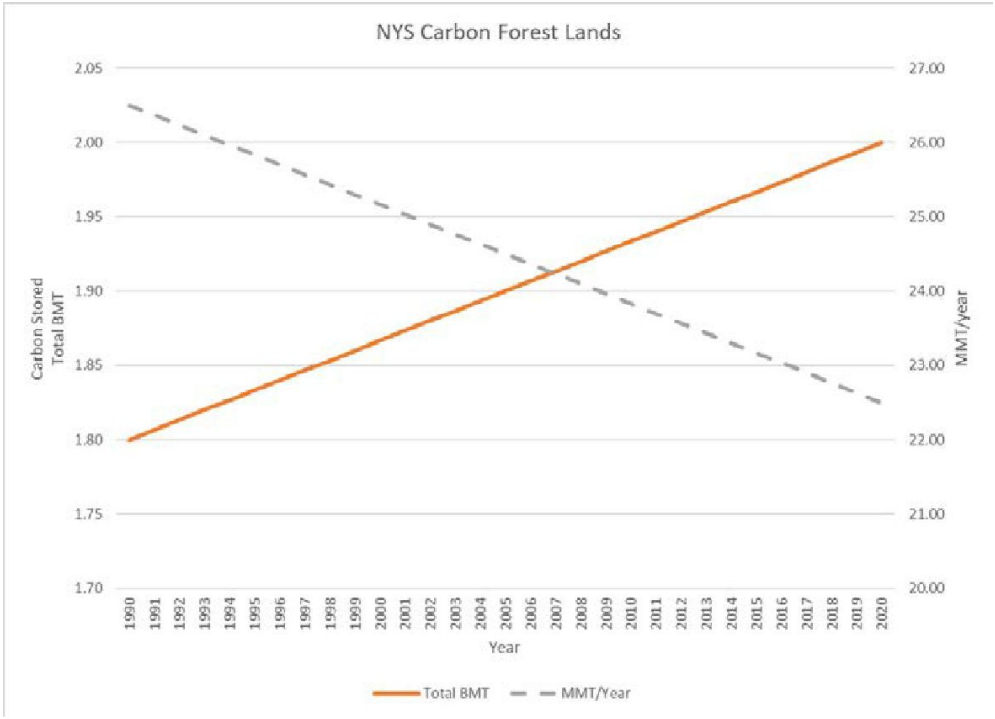
Forest Carbon



- NY forests are a carbon **sink**, meaning they sequester CO2 in the atmosphere and store it as aboveground biomass, below ground biomass and in the soil.
- In NY, forests provide for the only existing, large scale mechanism for removing CO2 from the atmosphere – 25 MMT annually. **Flux**
- Manipulating aboveground biomass(trees) is primarily what forest management does.

Harvested Wood Products Carbon





Forest Carbon

- Growth to Drain – 2:1
- Per Acre Carbon Sequestration Rising (line)
- Net NYS Forest Annual Sequestration Rate Declining (dashed line) – Forest Conversion

CLCPA: An opportunity for New York's Forest Sector

- New York's forests currently sequester 25 MMt CO_2 e per year.
- To help achieve Net Carbon Zero in 2050, we need our forests and wood products to contribute to the doubling the amount of carbon that is sequestered per year.
- Increase effectiveness of the NY forest sector to sequester and store carbon through:
  - Avoided Conversion
  - Improved Forestry Practices
  - Afforestation or Reforestation
  - Harvested Wood Products
  - Bioeconomy

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

An Important Concept: Increased Demand For Wood Can Provide Forest Carbon Benefits

Increased demand for wood triggers investments that:

(1) **increase forest area,**

(2) **increase forest productivity,**

(3) **reduce carbon impacts** associated with increased harvesting,

(4) i**ncrease carbon sequestered in harvested wood products** – durable long-term storage, **and**

(5) **substitution benefits** of wood products and energy from more fossil fuel intensive feedstocks.

The Integrated Forest Economy Value Chain

Mulch Operations

Bark

Pulp and Paper Mills

Bark

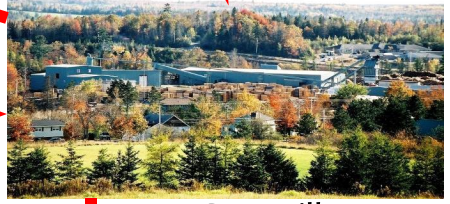
Pulp logs

Paper Chips

Bark

Working Forests

Saw logs



Sawmills

Sawdust

Veneer Logs

Biomass

Sawdust

Biomass and Pellet Plants

Plywood and Furniture Facilities

Market Recognition

* Recognize the role of markets in landowner decision making and keeping their forest as forest and making improvements in their forests to sequester more carbon.
* Recognize the overall carbon sequestration and substitution benefits of wood products.
* Recognize sustainable forest management as a means to achieve additionality in carbon sequestration as well as a host of other ecosystem benefits.
* Recognize the socio-economic benefits of forest-based communities.

Thank You

John K. Bartow, Jr.
Executive Director

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NEW YORK STATE CARBON FARMING REPORT

MAY 2020

8 MIN TOPICS

- CLCPA goals
- Farm GHG in NYS context
- The Importance of Evaluating 3 GHG on farm
- NYS mandated Global Warming Potential (GWP)
- 5 Conceptual Ways Farm Mitigate GHG
- SMART decision matrix
- Our Ranked Top 5 Opportunities for Ag GHG Mitigation
- CLCPA considerations
- If there is time: Accounting
  - Baseline
  - Permanence
  - Verifiability
  - Leakage

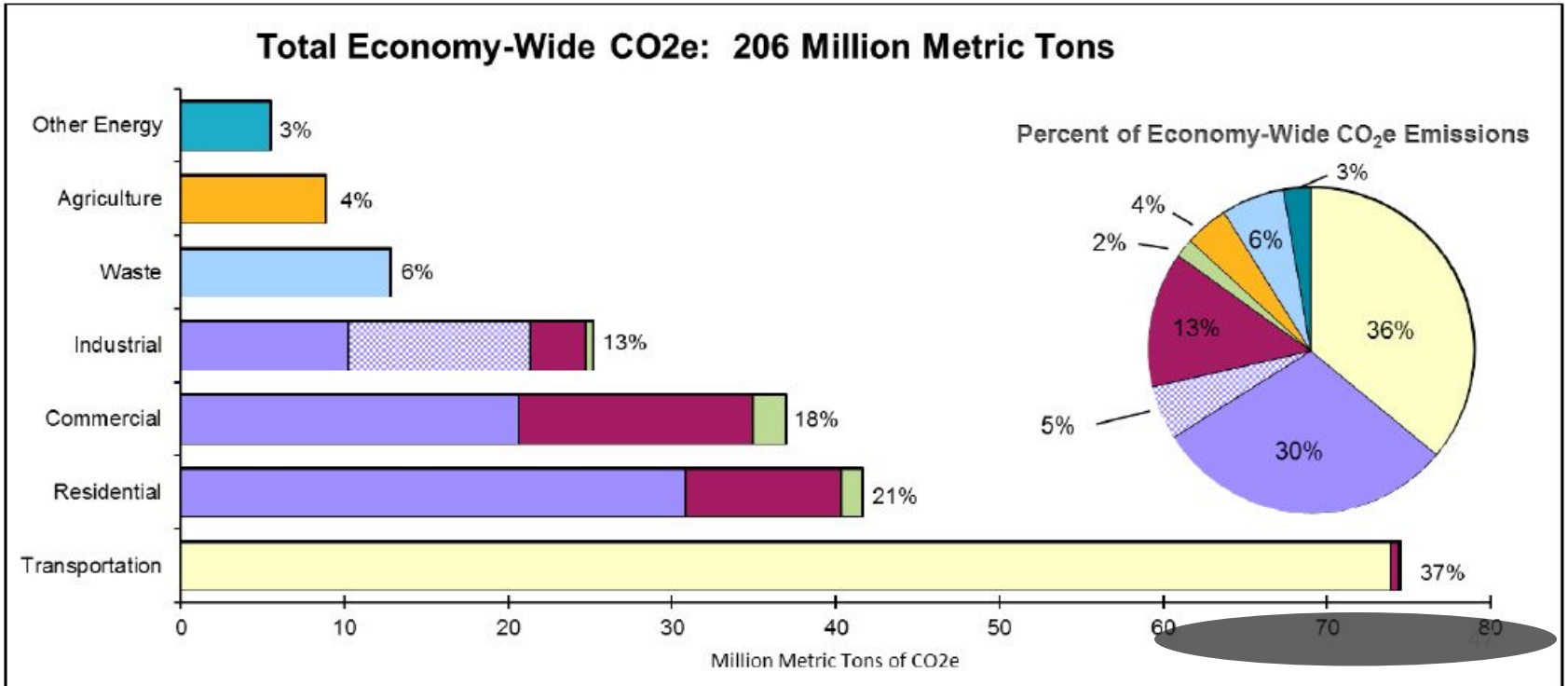
NYS GOALS

- 40% reduction in GHG by 2030
- 85% reduction in GHG by 2050
- Applies to all sectors including agriculture.

NYS GREENHOUSE GAS INVENTORY (1990-2016)

PUBLISHED JULY 2019

AGRICULTURE IS 4% OF THE STATE TOTAL EMISSIONS



GREENHOUSE GASES (GHG) EVALUATED

We evaluated three key greenhouse gases associated with working lands:

- Carbon dioxide, CO_2
- Methane, CH_4
- Nitrous oxide, N_2O

DIFFERENT GREENHOUSE GASES HAVE DIFFERENT POTENCIES

- Carbon Dioxide (CO_2) from fossil fuels account for ~80% of our global GHG

- But on farms, two Ag gases are much more potent GHG.
  - Methane (CH_4)
  - Nitrous Oxide (N_2O)

- To account for these differences, scientists created a unit called Carbon Dioxide Equivalents or "CO_2e."

GLOBAL WARMING POTENTIAL (GWP)

Greenhouse Gas	Potency (relative to CO2) 20 year-time (IPCC AR5)	Potency (relative to CO2) 100 year-time (IPCC AR4)
Carbon Dioxide (CO2)	1	1
Methane (CH4)	84	25
Nitrous Oxide (N2O)	264	298
	NYS 2019 CLCPA* ruling will use these 20-year values	Carbon Farming report used these 100-year values

CLCPA= Climate Leadership and Community Protection Act, signed 2019.
https://climate.ny.gov/

GLOBAL WARMING POTENTIAL (GWP)

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CLCPA= Climate Leadership and Community Protection Act, signed 2019.

75% OF AGRICULTURAL GHG COME FROM CH4 AND N2O EMISSIONS

Because they are so much more potent GHG, very small amounts of methane and nitrous oxide are very large players in farm GHG accounting.

Most sectors focus on carbon dioxide, But agriculture must consider all three gases together.

ON-FARM GREENHOUSE GAS MITIGATION

5 BROAD CATEGORIES

Sequester Carbon	Trees, Soils, Long-lived wood products
Destroy Methane	Capture methane from manure storage and flare it
Increase Efficiency	Energy use on farm, Milk production efficiency, Crop production efficiency, Nitrogen-use efficiency
Displace Fossil Fuels	Produce renewable energy Displace concrete/steel w wood
Conserve	Energy, Natural Resources, Leave forest as forest

TYPES OF PRACTICES

Dairy	• Feed management (CH_4, N_2O) • Manure storage (CH_4, N_2O) • Milk product efficiency (CH_4, N_2O)
Crops	• Nitrogen management (N_2O, CO_2) • Soil Carbon (N_2O, CO_2)
Woodlands	• Improve forest management (CO_2) • Agroforestry (alley crop, silvopasture)
Idle Lands	• Afforestation (CO_2) • Solar/Wind energy (CO_2) • Biomass for feed or fuel (CO_2)
Conserve	• Reduce Energy or Resource Use • Reduce Consumer Food Waste • Conserve Land (Forest stays forest)

The GOAL

DETERMINE EFFECTIVE PRACTICES FOR AGRICULTURE TO MITIGATE GHG

MULTIPLE EVALUATION CRITERIA:

INTRODUCING THE **SMART MATRIX**

- **S**ervices – co-benefits
- **M**easurable quantity at the NYS level
- $ to **A**chieve implementation
- **R**ealistic to implement?
- **T**imeframe of implementation

Refer to pages 16-29 of our report for NYS AGM:

New York Agriculture and Climate Change: Key Opportunities for Mitigation, Resilience, and Adaptation.

13 PRACTICES EVALUATED

1. Afforestation of Idle Lands
2. Manure Storage Cover & Flare
3. Reduced Food Waste
4. Renewable Energy
5. Woodland Management
6. Cover Crops & Double Crops
7. Feed Management
8. Alley Cropping (10% of Ag land)
9. Replace Annuals with Perennials
10. Crop Nutrient Management (N-fertilizer reduction)
11. Riparian Buffers
12. Biochar
13. Reduced Tillage/No Tillage

OUR TOP 5

BASED ON
SMART CRITERIA

Manure Cover and Flare

Nitrogen-Use Efficiency

Feed Efficiency

Improved Management of Woodlands

Planting Trees on Idle Lands

TOP 5 MITIGATION PRACTICES

- Cost 0-$50 per MT CO2e mitigated
- Represent
  - real mitigation
  - permanent mitigation
- Most can be directly verified
- Have a suite of co-benefits
- Many increase production/efficiency of NYS Agriculture.

TOP 5 MITIGATION POTENTIAL

(PRELIMINARY ESTIMATES)

EMISSIONS

23.2 MMT CO2E

- Enteric: 12.5 MMT CO2e
- Manure Mngmt: 6.7 MMT CO2e
- N emissions: 2.5 MMT CO2e

- Other emissions: 1.5 MMT CO2e
- Total Emissions: **23.2 MMT CO2e**

MITIGATION <$50/MTCO2E

-13.9 MMT CO2E

- Feed Efficiency: -2.3 MMT CO2e
- Cover+Flare: -4.3 MMT CO2e
- N-efficiency: -0.2 MMT CO2e
- Ag Woodlands: -TBD
- Afforest Idle Land: -4.9 MMT CO2e *****

- Top 5 Mitigation: **-13.9 MMT CO2e**

* Assumes all idle land is forested.

NYS GOALS

- 40% reduction in GHG by 2030
- 85% reduction in GHG by 2050

Agriculture can meet these goals!

CLCPA CONSIDERATIONS: UPSTREAM

- UPSTREAM emissions
  - Energy Sector must consider upstream factors and imported energy
  - Ag does not have to evaluate upstream factors or imported food/feed
    - We Import a Lot of Food.

- IMPLICATION
  - The Energy Sector is looking at Ag Land for solar and other renewables In State.
  - ***Land Use consideration***

CLCPA CONSIDERATIONS, CONT.

- NYS chose a 20 yr GWP – which changes the total value of CH4 emissions but the priority of the gases remains the same.

- Livestock has been exempted from the ‘legally enforceable’ emission limits
  - Consider: What happens when a regulated sector moves into the Ag sector etc.

- Emissions must be mitigated first (85% reduction of

ACCOUNTING

- BASELINE
  - E.g. mitigating passive CH4 production from manure storage is different than intentionally producing more CH4 for maximal bioenergy.
- NET Emissions
  - E.g. not JUST c-sequestration but CO2 + CH4 + N2O flux, combined
- PERMANENCE
  - E.g. If cocacola sequester CO2 in a can of soda today, and you open it tomorrow…
- VERFIABILITY
  - E.g. Ensure society is Actually meeting it's mitigation in actuality.

GHG ACCOUNTING: LEAKAGE

- Across Sectors
  - Energy Sector puts solar on 10% of Agricultural Acres
    - Does the Ag sector just ‘lose’ that industry?
    - Does the Ag sector move to idle or underutilized land w lower yields and higher GHG?
    - Does the Ag sector move production to Pennsylvania
- Across State Boundaries

- It’s a real accounting issue and stipulated in the CLCPA mandate

DOLLAR ACCOUNTING: LEAKAGE

- Imagine the Energy Sector Places solar on 10% of Agricultural Acres
- Yes, we now have diversified the Farm Economy w 10% renewable energy
- BUT, we have lost
  - The labor of working that land
  - The locally produced food/feed/fiber/biofuel
  - The processing/transportation/manufacturing labor
  - The decades of tree removal, stone removal, soil improvement of past farmers.

- If we can nudge solar development to the idle or underutilized lands, we maintain farm product and labor AND add new labor and industry to an underutilized landbase

CONTEXT OF VALUE

CO-BENEFITS ON SITE

QUANTIFIABLE MITIGATION

COST TO IMPLEMENT

CAPACITY TO PAY

FINANCIAL WAYS TO MITIGATE FARM GHG

Market Driven

Voluntary actions

Double cropping to increase product sales on farm

Public Financial Support

Federal/State/Local Govt's provide expertise, grants, tax incentives, and/or peer-support systems

Compliance Driven

Cap and Trade programs like RGGI –

For example, the electric sector regulation paying for reforestation 'offset' projects for carbon mitigation.

SOME EXISTING PROGRAMS

- Climate Resilient Farming (CRF)
  - Cover/flare
  - Soils
  - Water quality
- Trees for Tributaries
- SWCD/CU cooperative extension outreach
- Ag & Markets Tier II
- NYS Environmental Protection Fund (EPF) “Open Space Program”
- Conservation Easements
- Potentially Regional Greenhouse Gas Initiative (RGGI) offsets

CLIMATE RESILIENT FARMING

SINCE 2015

PROJECT FUNDING

- 4 rounds
- $8 million for projects on 121 farms

MITIGATION

- -15,500 MT CO2e/yr

SCALE UP

- Basic infrastructure is in place!

MOVING FORWARD:

CONSIDERATIONS

1. Evaluate all GHGs together
2. Prioritize Permanent & Verifiable practices
3. Consider co-benefits & other State objectives
4. Compare alternatives for current and former agricultural land
   - Bioenergy
   - Solar
   - Wind
   - Afforestation
   - Increased ag production
5. CELEBRATE: We are FINALLY HERE!

THANK YOU!

NYS Department of Agriculture and Markets

NYS Department of Environmental Conservation for current work

NYS Energy Research and Development for previous work

Contact us:

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Peter Woodbury pbw1@cornell.edu

KEY REFERENCES

- **New York Agriculture and Climate Change: Key Opportunities for Mitigation, Resilience, and Adaptation.** (NYS Carbon Farming Report). Jenifer Wightman and Peter Woodbury. May 2020. https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/2/7553/files/2020/07/CarbonFarming_NYSAGM_FINAL_May2020.pdf

- **Sources and sinks of major greenhouse gases associated with New York State's natural and working lands: Forests, farms, and wetlands.** McDonnell TC, Sullivan TJ, Woodbury PB, Wightman JL, Domke GM, Beier CM, Trettin C. 2020. NYSERDA. 20-06. 116 p. February 2020. https://www.nyserda.ny.gov/About/Publications/Research-and-Development-

New York Farmers Mitigating Climate Change

Samantha Levy

New York Policy Manager

American Farmland Trust

Farming in New York State

Farms contribute a total of **$47 billion** to the state's economy and support **160,000 jobs**

New York has **nearly 7 million** acres of farmland, about **a quarter** of the state's land is in farming. **25%** of New York's farmland is **rented**

American Farmland Trust

Our Changing World: What We Know

Farmers are on the Front Lines of Climate Change: Feeling Impacts of Extreme Weather, and Changing how we Grow Food

Food Security: We Need to Produce 50% More Food to Feed a Growing Population by 2050

We Must Cut Emissions as Quickly as Possible to Stay Below 2°c of Warming

AND We Must Sequester Carbon Already Emitted into the Atmosphere to Do So

Forests and Farmland Play a Key Role in the Climate Solution

#NWLChallenge

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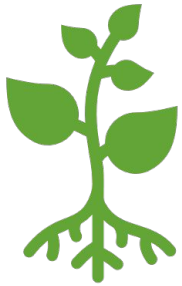
Goals for Agriculture to Help New York Achieve Net Zero Emissions by 2050



Double annual carbon sequestration on natural and working lands to **60 mmt of CO2 equivalent by 2050**

Reduce annual GHG emissions from agriculture by **30% by 2050**

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Helping Farmers Adopt Practices that Sequester Carbon and Reduce GHGs

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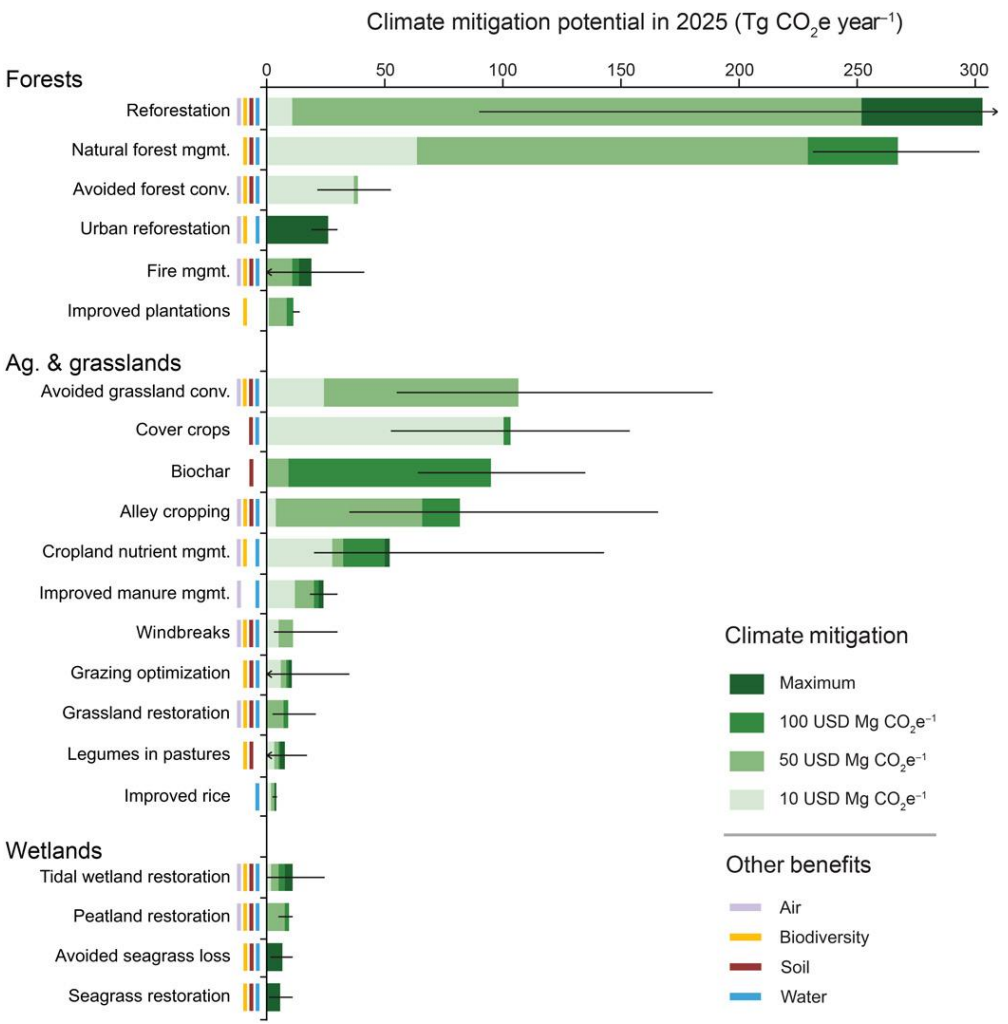
Potential for GHG Reductions and Carbon Sequestration on Agricultural Lands

Natural and working lands can sequester 21% of national GHG emissions, if properly managed



Fargione et al, Science Adv 2018

Why Regenerative Farming Practices?

Soils store

2-3x more carbon than the atmosphere and **2-5x** more carbon than plants, and how we manage them matters.

Countless co-benefits including resilience to extreme weather events, increased biodiversity, wildlife habitat, cleaner water and air, soil health, and improved farm viability

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What are Farmers Already Doing? What could they do More of?

- Cover Crops
  - Planted on over 295,000 acres, a 37% increase from 2012
  - Sequestering 35,000-66,000 tons CO_2e/yr
  - Only Planted on 12% of acres available
  - **Potential to sequester up to 267,000 tons CO_2e/yr**

- No Till/Reduced Tillage
  - 1.1 million acres reported reduced tillage and no till out of 1.9 million possible acres
  - No Till showed an Increase of 21% from 2012
  - This has potentially reduced 223,000 tons CO_2e/yr
  - **Converting all Intensive and Reduced Tilled acres to No Till could sequester an additional 597,000 tons CO_2e/yr**

Between Cover Crops and No Till alone,
New York farmers could sequester 1.13 million tons of CO_2e/yr

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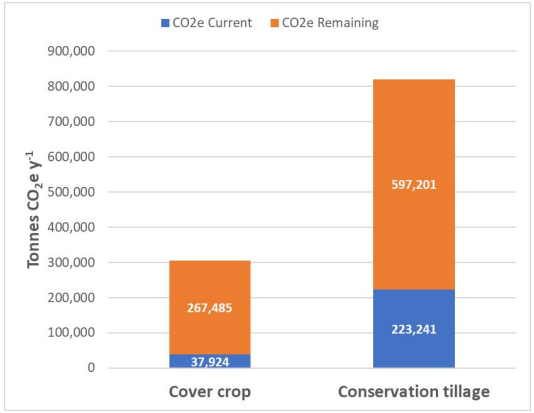
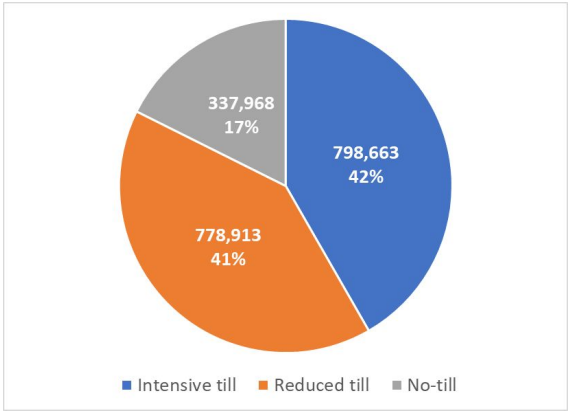
Data comes from CaRPE Report which draws from 2017 USDA Agricultural Census and COMET Planner





Other On-Farm Practices that Achieve Net Carbon Sequestration in New York Soils and their Potential

Management Focus	NRCS Conservation Practice Name	Relative GHG Benefit and Annual Potential GHG Reduction (tons of CO_2e)	COMET Application
Soil Health	Mulching	1,390,000	Add high carbon organic matter to croplands (e.g., straw or crop residues)
	Strip cropping	1,025,000	Add perennial cover in strips
	Conservation Crop Rotation	956,000	Decrease fallow or add perennial crops to rotation
	Residue and Tillage Management, No Till & Strip Till	855,000	Intensive or reduced tillage conversion to no-till or strip till
	Cover Crop	530,000	Add legume cover with 50% fertilizer N reduction
	Residue and Tillage Management, Reduced Till	376,000	Intensive tillage conversion to reduced till
	Cover Crop	280,000	Add non-legume cover with 25% fertilizer N reduction
Nitrogen Management	Nutrient Management	191,000-1,470,000	Reduce synthetic N application rate by 15% over 5 years by adding organic N source (e.g., manure or compost)

https://farmland.org/carpetool/

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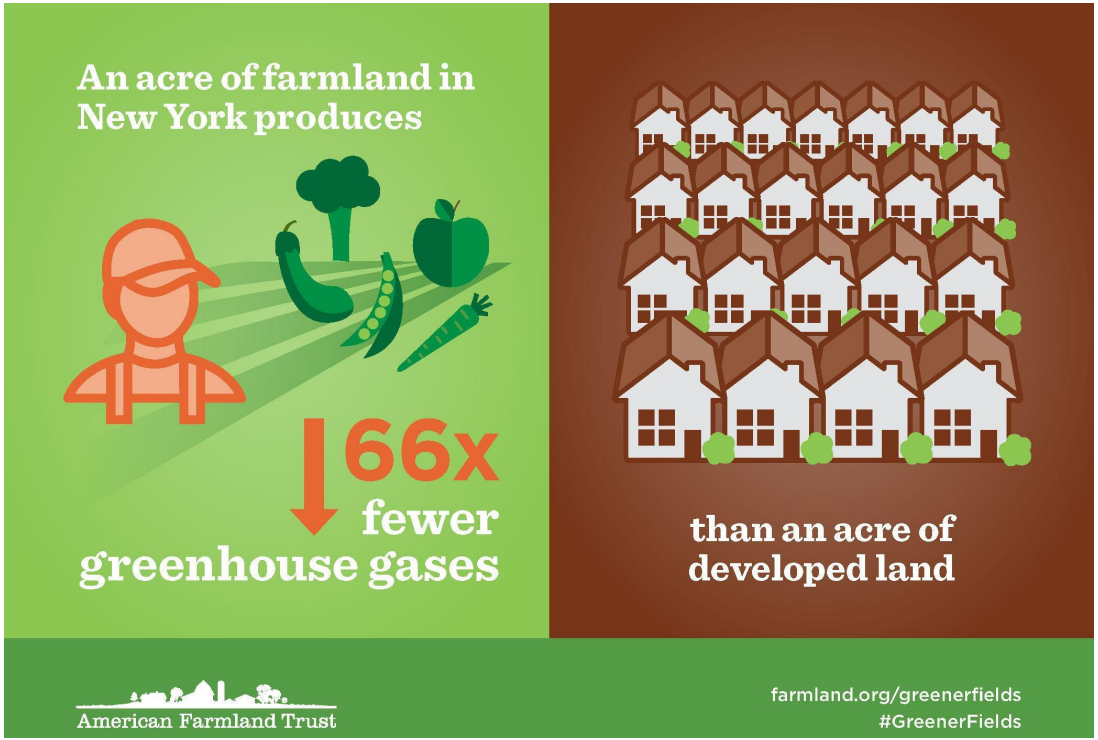

Keeping Land in Farming to Reduce GHG Emissions

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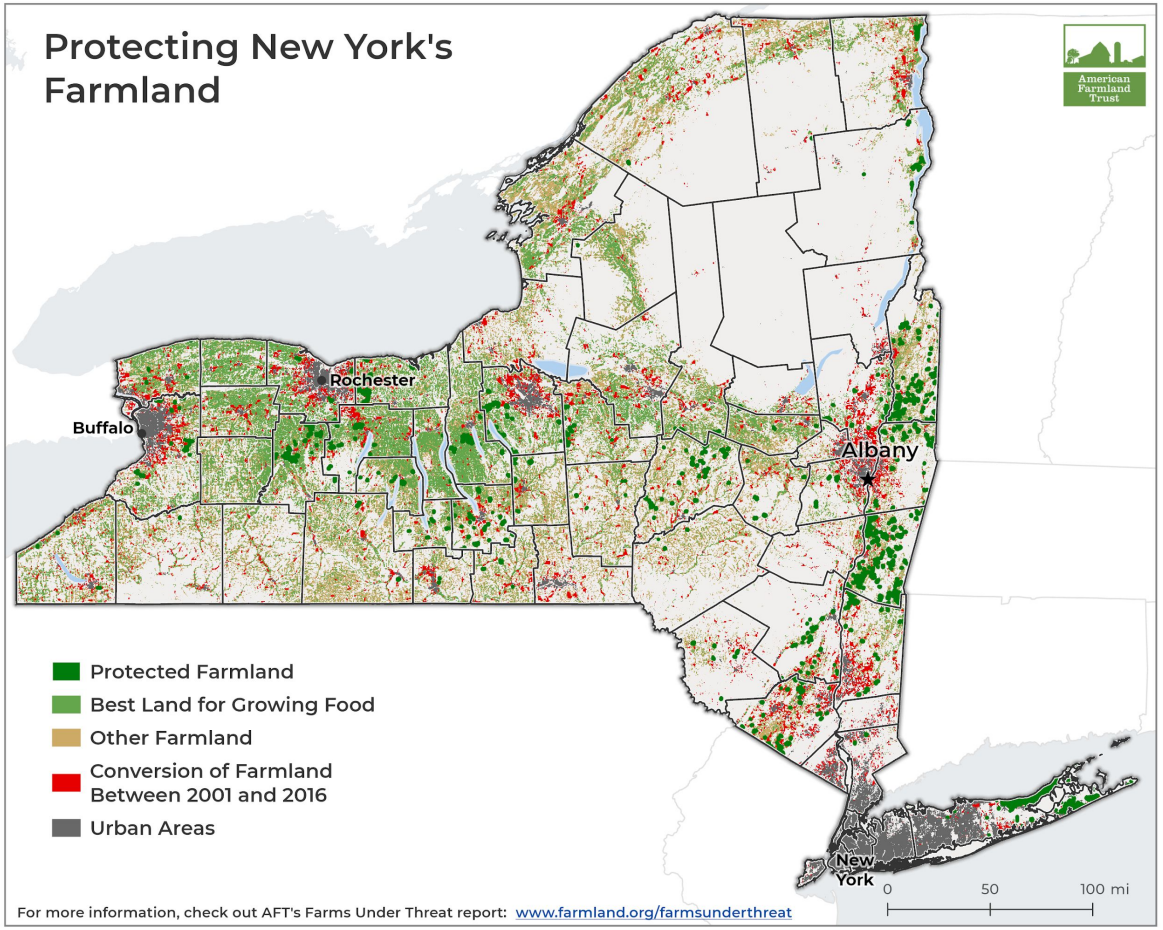

- Between 2001 and 2016 NY **lost a quarter of a million acres of farmland**
- 54% of the State's Farmland is **Nationally Significant**, or best suited for growing food and sequestering carbon with little environmental impact over time
- We have permanently protected **only 76,000** acres of farmland, or less than 1% of our farmland

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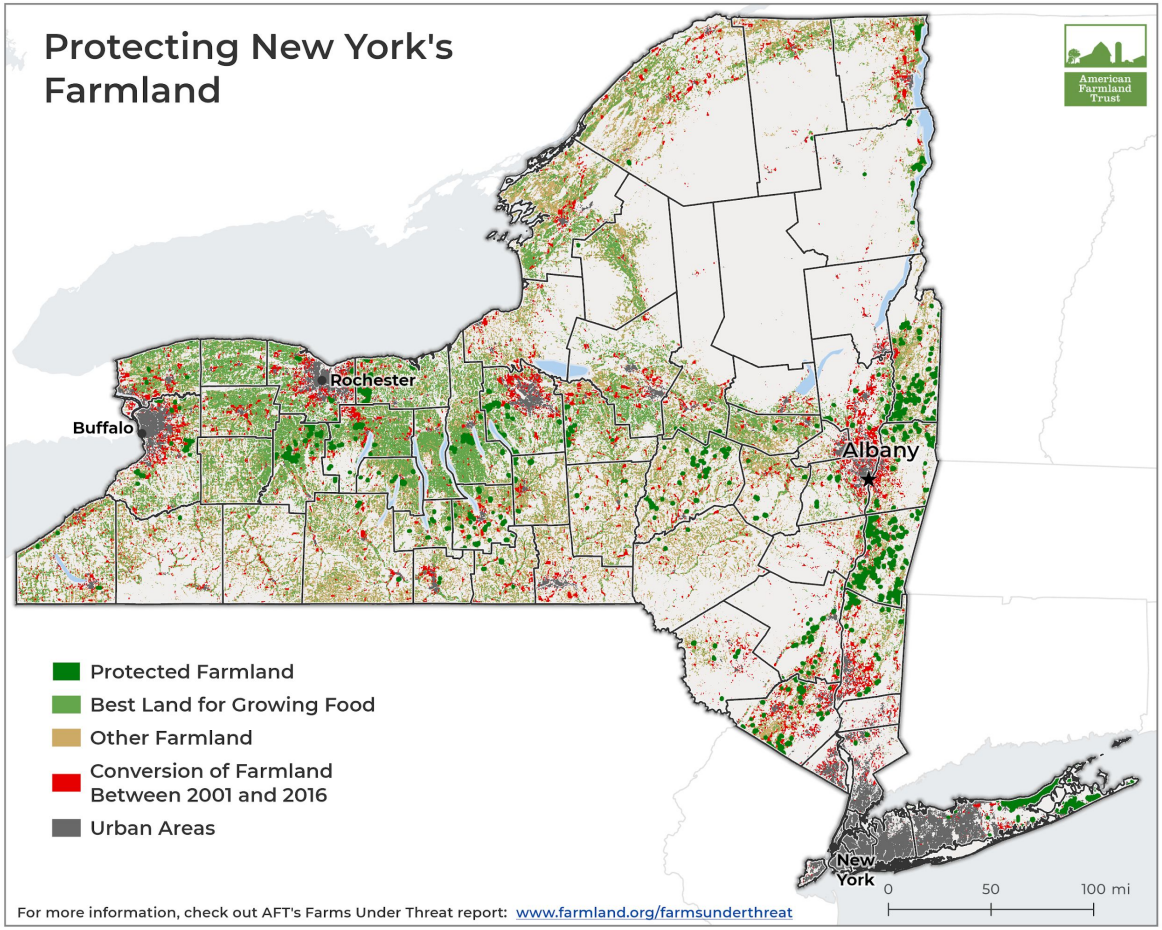

Permanent Farmland Protection Retains Carbon Sequestered in Soils with Continued Good Management, but can Further Reduce GHG Emissions

California's Sustainable Agricultural Lands Conservation Program has Invested $180 million to Protect 112,000 acres and support Smart Growth, avoiding **55 mmt CO2 equivalent from VMT over the next 30 years**

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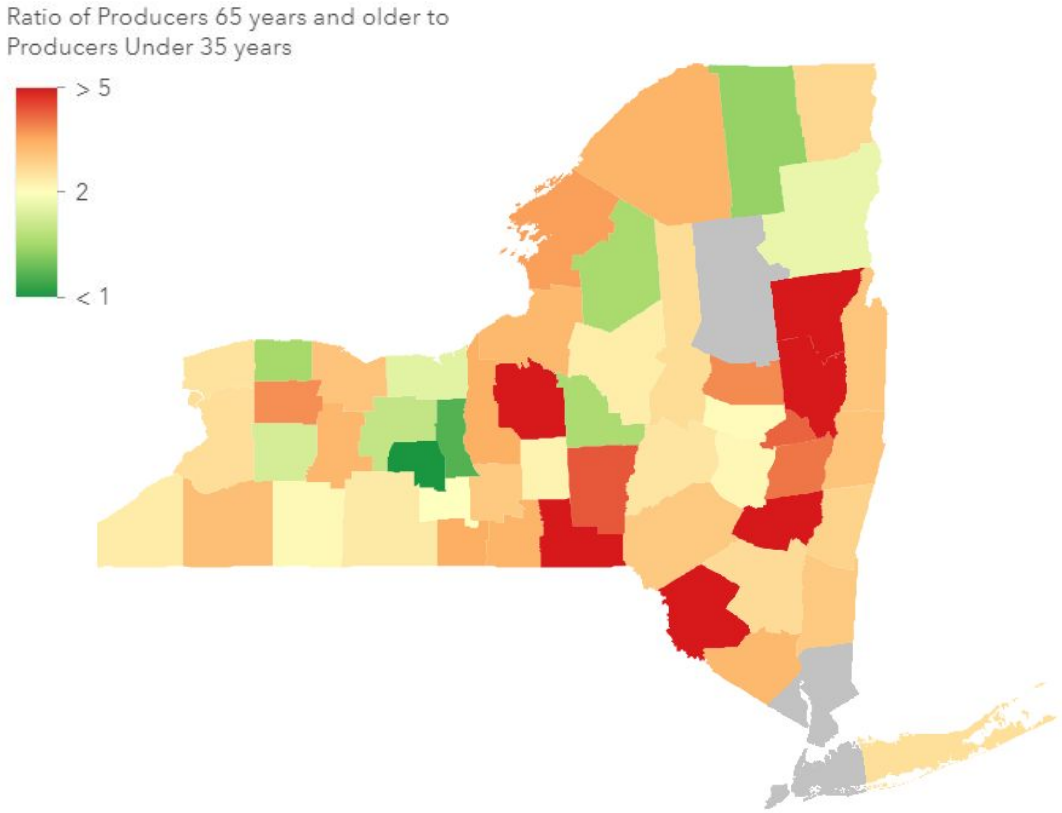
We Must Help a Diverse New Generation Get Started in Farming

Farmers over 65 own or operate nearly 2 million acres of land

92% of senior farmers do not have a young person working alongside them

It is difficult for young, beginning, new and BIPOC farmers to access land

- www.nyfarmlandfinder.org



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Policies, Programs, and Solutions

HELPING FARMERS JOIN THE FIGHT AGAINST CLIMATE CHANGE

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Current Research, Policies and State-Level Programs

- **Programs to Protect Farmland and Help Farmers Adopt Climate Smart Practices in State Budget:**
  - Support for Technical Assistance: Soil and Water Conservation Districts, CCE, private advisors, AFT, NOFA-NY
  - Water Quality Programs: Agricultural Non-Point source, Agricultural Environmental Management
  - Cornell Soil Health Institute
  - Climate Resilient Farming Grants
  - Farmland Protection Program
  - Farmland for a New Generation New York
- **Research for Improved Measurement and Verification of Carbon Sequestered on Farmland**:
  - HV Carbon Farming Pilot with Hudson Carbon
  - AFT FFAR research to Model Soil Carbon with Depth
  - AFT Conservation Innovation Grant project to Address Barriers to Cover Crop adoption in New York
  - Other Projects in Massachusetts, California
- The Agriculture and Forestry Advisory Panel to the Climate Action Council is Currently Preparing a Scoping plan to Ensure New York meets its GHG emissions reduction and carbon sequestration goals

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New and Innovative Policy and Funding Ideas

Helping Farmers Adopt Practices:

- Carbon Farming Tax Credit Bill (Assemblywoman Didi Barrett)
- New York State Soil Health Legislation (Assemblywoman Donna Lupardo)
- Improved TA: Whole Farm Carbon or Climate Planning (under discussion by Advisory panel/NYSDAM)
- Payments for Practices Programs
- Consumer Marketing Labels
- Innovative Funding Ideas: Restore Mother Nature Bond Act, RGGI

Farmland Protection:

- Adapt California's program to New York State
- Legislation to Set a Goal to Protect 30% of NYS natural and working lands by 2030 (New Bill: Kaminsky/Fahy)
- Vote Yes for Innovative Funding on your Ballot! Restore Mother Nature Bond Act, Community Preservation Funds

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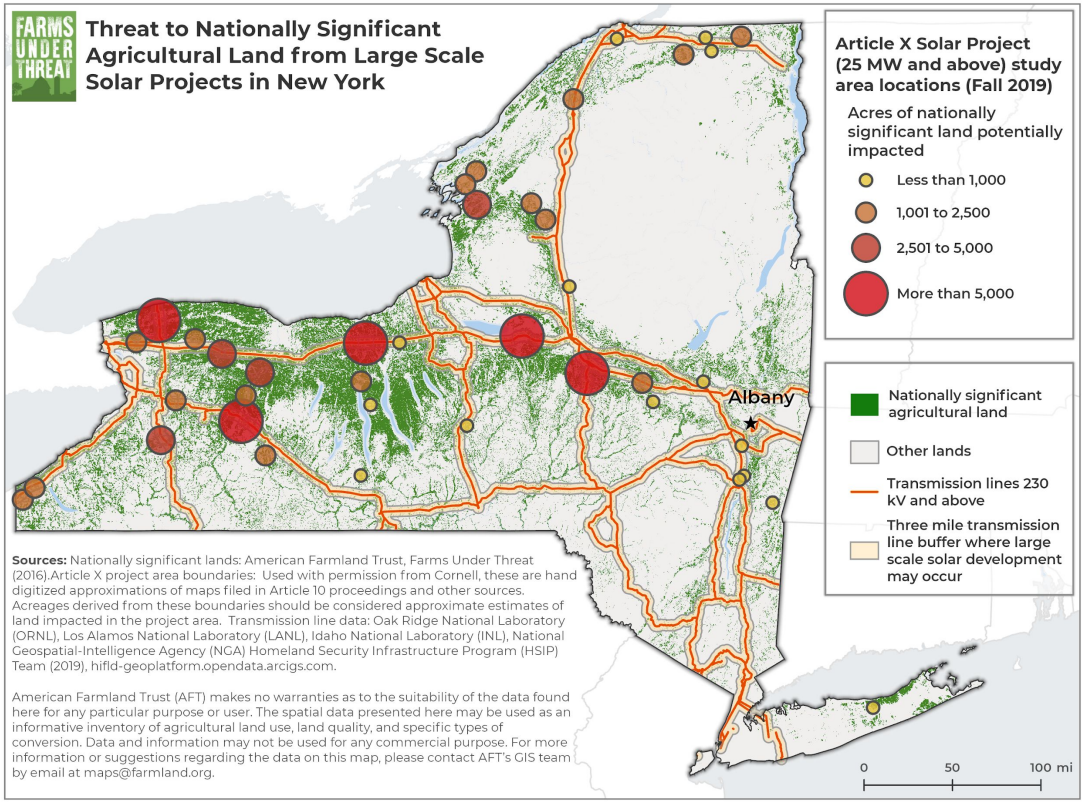

Other Key Considerations

- Helping Farmers Adopt Practices Long Term, and on Rented Farmland
- Food Security Considerations
- How Other Climate Policies Interact with These Goals

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Questions?

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WWW.FARMLAND.ORG

John Macauley, Macauley Farms

Farm at a Glance

COUNTY: Livingston, NY

WATERSHED: Genesee River

CROPS: Grain corn, soybean, & wheat

FARM SIZE: 1,106 acres

SOILS: Clay, loamy, & gravelly soils on flat & rolling hills

SOIL HEALTH PRACTICES: No-till, cover crops, & nutrient management

New York's Organic "Waste" Resource:

Renewable Natural Gas (RNG)

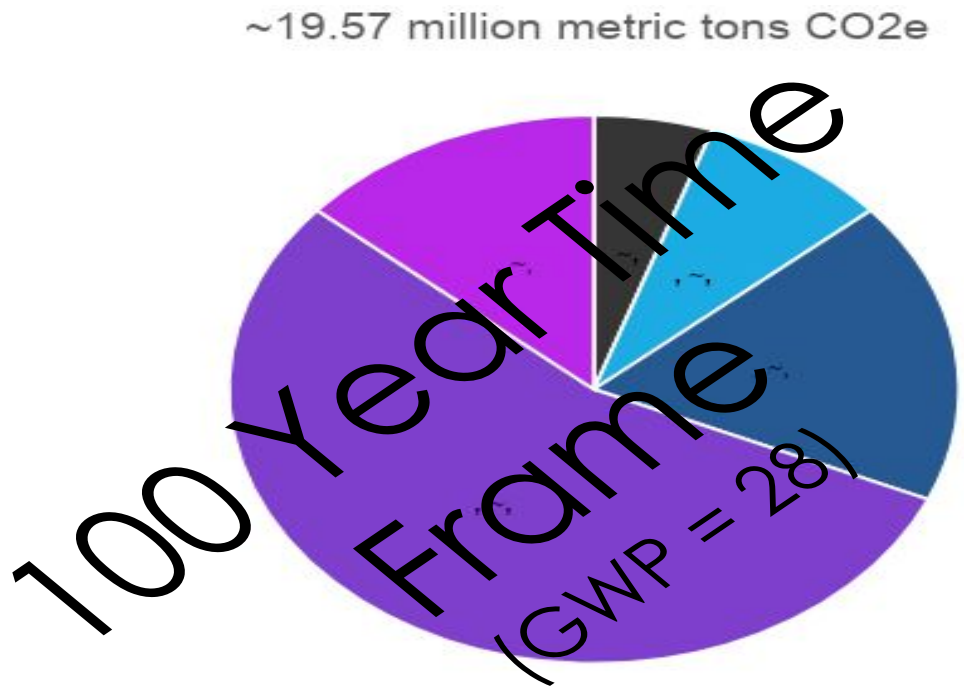
Nat'l Trends and an Untapped NY Opportunity

Matt Tomich, President, Energy Vision

NYLCVEF CLCPA Forum – January 14, 2021

ENERGY VISION

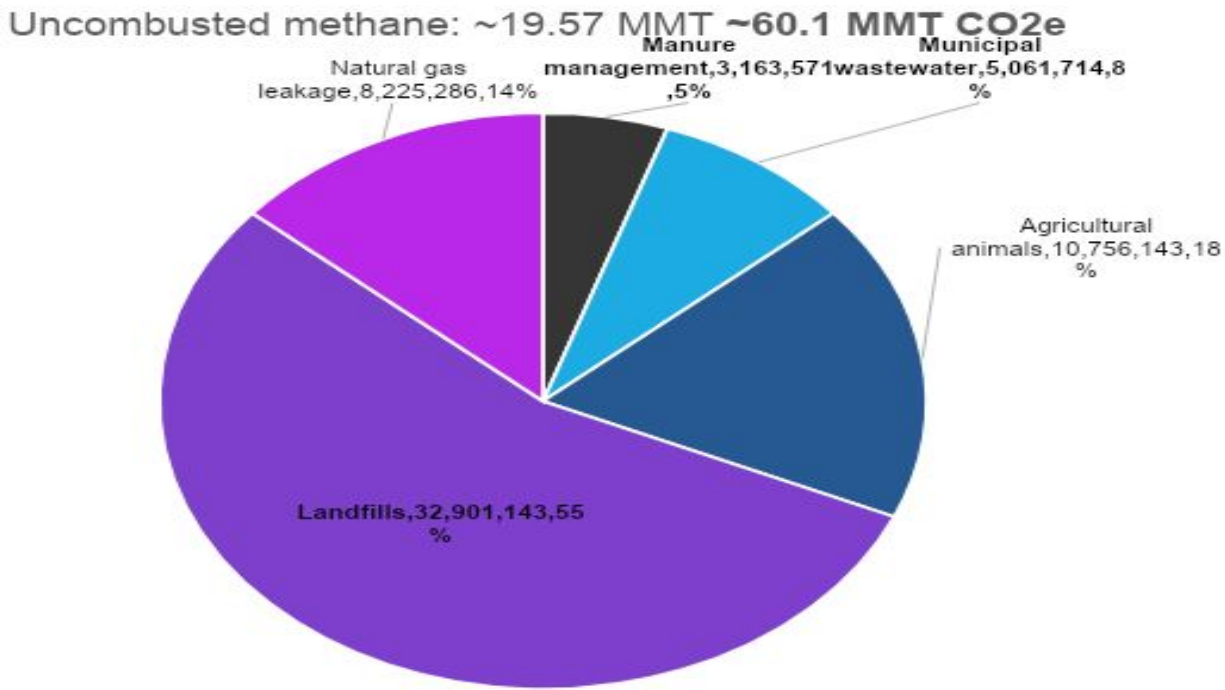
Why Focus on Methane?



Source: NYSERDA 2019 GHG Inventory

~9.5% of total NYS GHGs

20 Year Timeframe (GWP = 86)



- ~~*~9.5%*~~ *~29% of total NYS GHGs*

Biogas 101

- When organic wastes decompose in an oxygen-free environment (like a landfill), they release *biogas*. This process is called ***anaerobic digestion***.

- Biogas is 50% - 65% methane (depending on the source).

ENERGY VISION

Landfills

Water Treatment Facilities

Dairy Farms

Cornell PRO-DAIRY

ENERGY VISION

Historically, biogas has been used to produce electricity and/or heat

CHP system at landfill, Quebec

CHP system at Coney Island WRRF, NYC

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Biogas can also be *upgraded* to **renewable natural gas (RNG)**

- 95+% methane
- "Pipeline quality"
- Flexible, multi-purpose

RNG is a versatile energy source that can readily displace fossil fuels in a variety of applications:

- Power Generation
- Industrial Uses
- Heating/Cooling/Cooking
- Transportation (vehicles with natural gas engines)
  - ***Has much lower lifecycle emissions: 50% to 300+%***




ENERGY VISION

The Major Market: Transportation

Wastes

All organic wastes contain energy.

Biogas

Anaerobic digestion of wastes at landfills or in digester plants produces energy-rich biogas.

RNG Fuel

Biogas upgrading removes carbon dioxide & impurities to make ***renewable natural gas*** (RNG).

Fuel Stations

RNG goes to on-site fueling stations, or by truck or pipeline to off-site pumps.

Vehicles

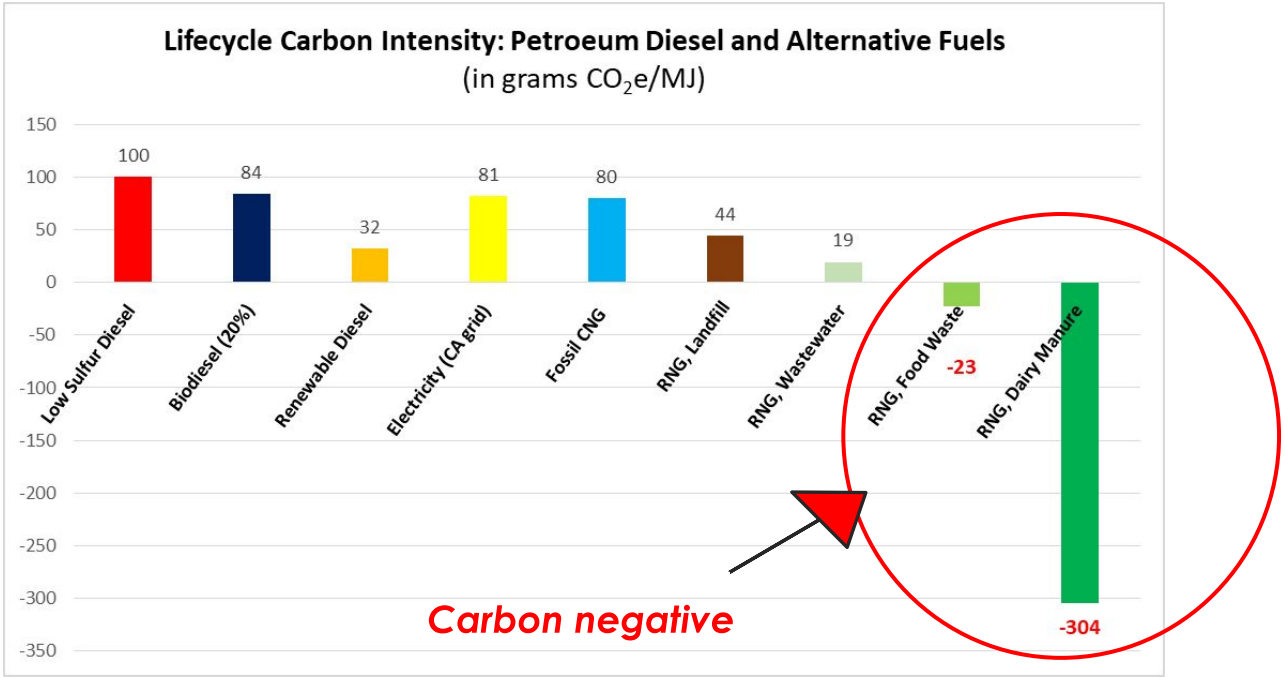
RNG works just like regular natural gas to power vehicles.

The Pathway from Organic Waste to RNG Vehicle Fuel

Growth of RNG in transportation supported by incentives

- Federal **Renewable Fuel Standard** (RFS)
- California **Low Carbon Fuel Standard** (LCFS)
- Oregon **Clean Fuels Program**

The Climate Case for RNG in Transportation



Source: California Air Resources Board, LCFS Pathway Data, 2020

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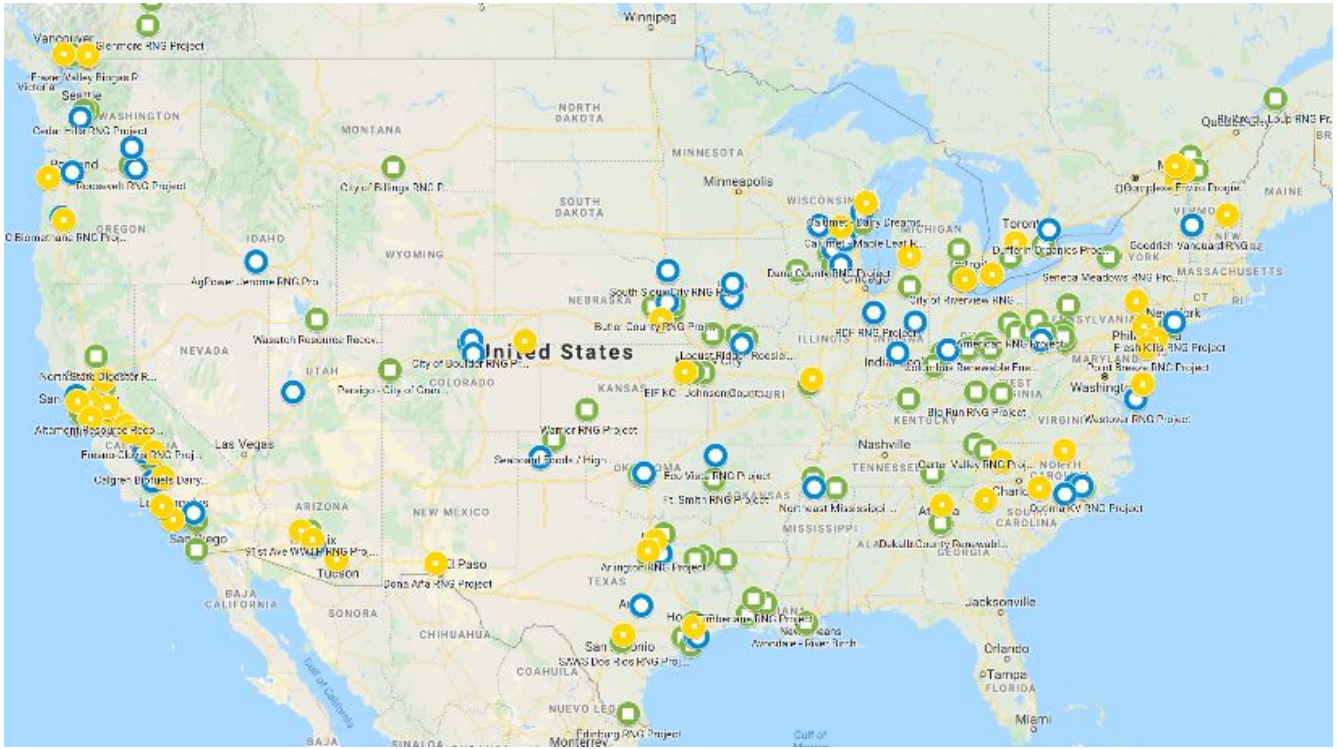
RNG Projects Nationwide



~160 RNG projects operating today, up from just 60 projects in 2017; ~150 more under development

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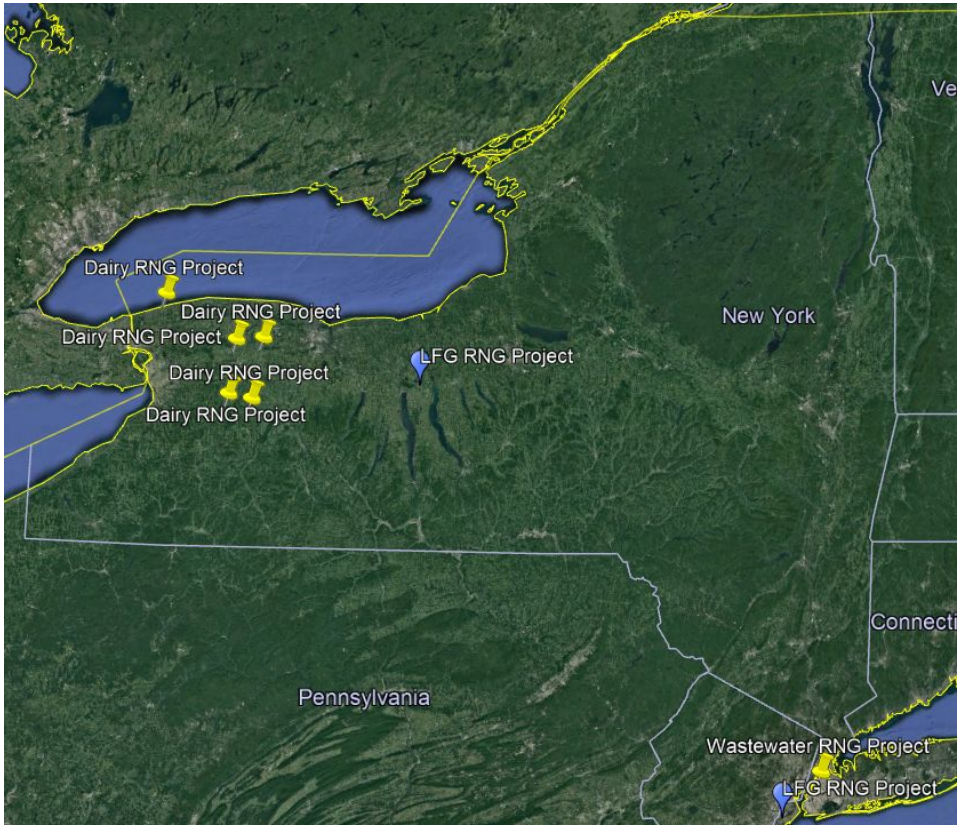
RNG projects in New York State



NY's Largely Untapped Opportunity

Food waste

NYS: **3.9 million tons** annually

2022 **landfill diversion mandate**

Wastewater

NYC: 14

NYS: almost 600

145 have digesters

Landfills

NYS: 25

Agriculture

#4 producer in the U.S. with **~627,000 dairy cows**

28 existing digesters

200+ candidate large farms

~400 candidate smaller farms

ENERGY VISION

Contact Info:

Matt Tomich, President

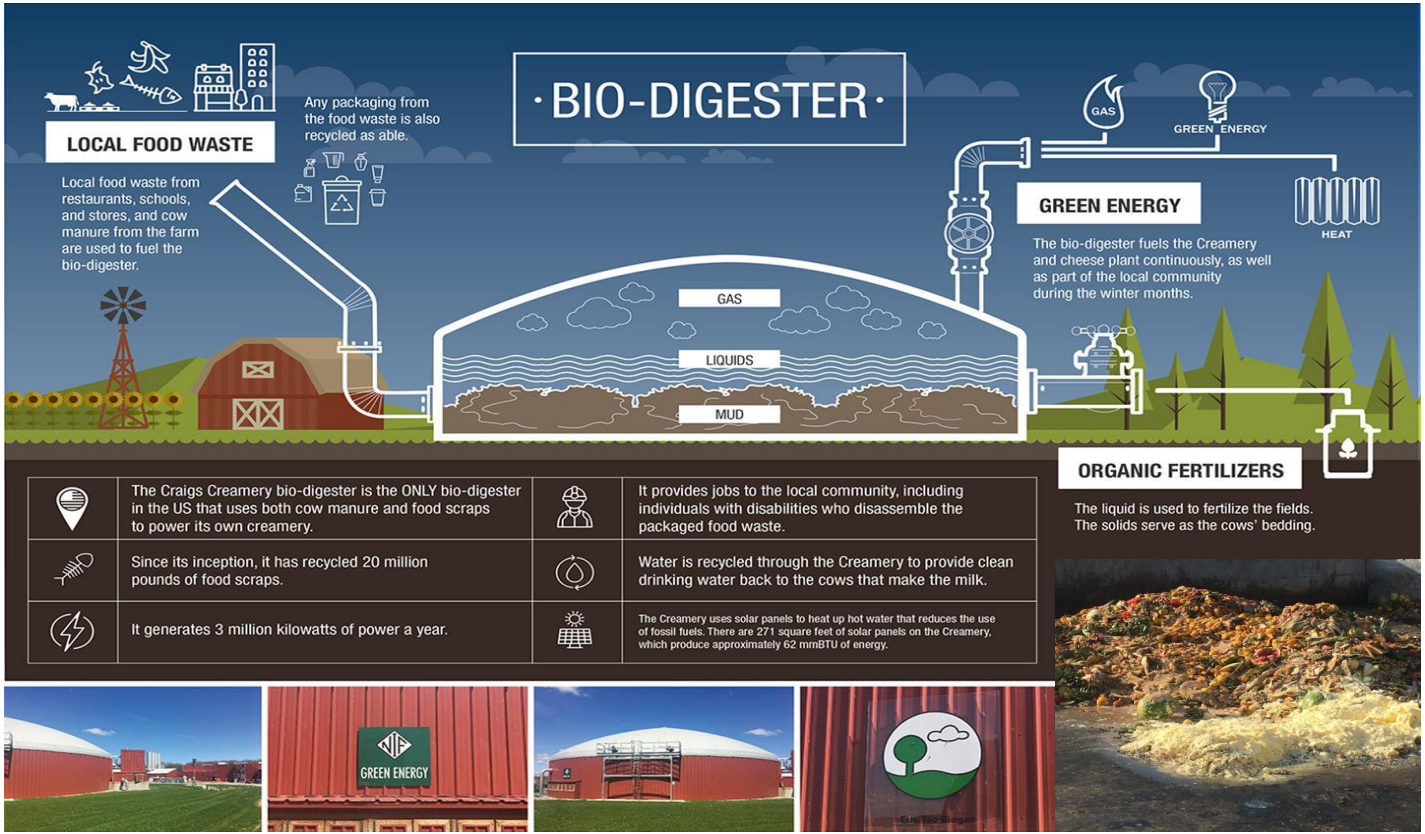
email: tomich@energy-vision.org
tel: 212.228.0225
web: www.energy-vision.org

ENERGY VISION

Noblehurst Farms Campus Overlooking the Genesee Valley

Noblehurst Green Energy

Renewable Energy from Manure and Food Waste



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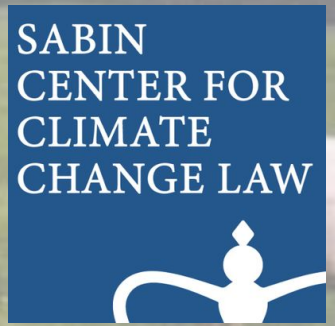

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