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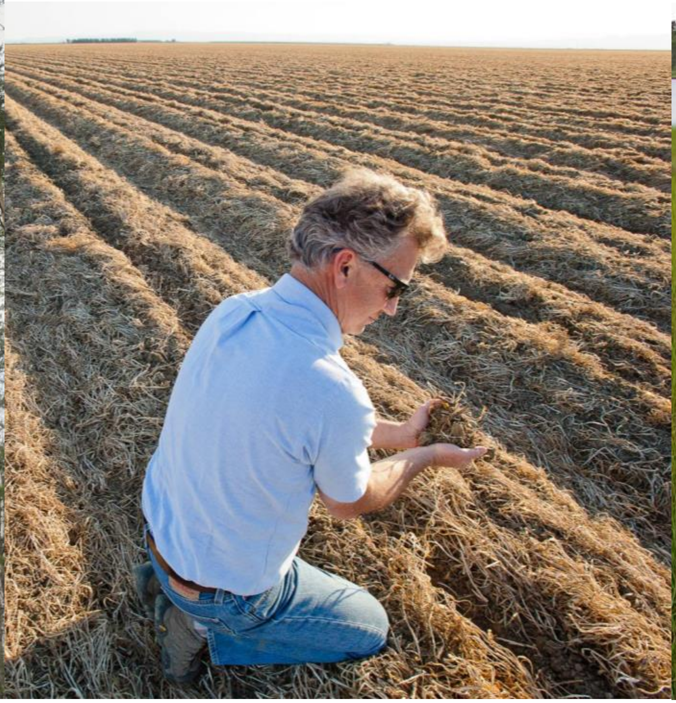
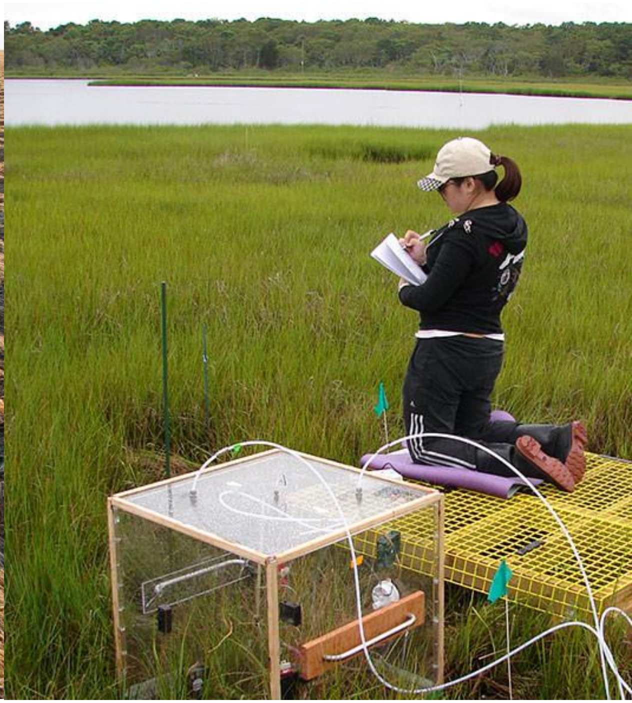
Forest-Climate Opportunities in Eastern States

Jad Daley, President &CEO
@JadDaley



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American Farmland Trust

C-AGG

The Nature Conservancy

THE TRUST FOR PUBLIC LAND

WORLD RESOURCES INSTITUTE

UNITED STATES CLIMATE ALLIANCE

STATES UNITED FOR CLIMATE ACTION

Helping States to Lead with Land

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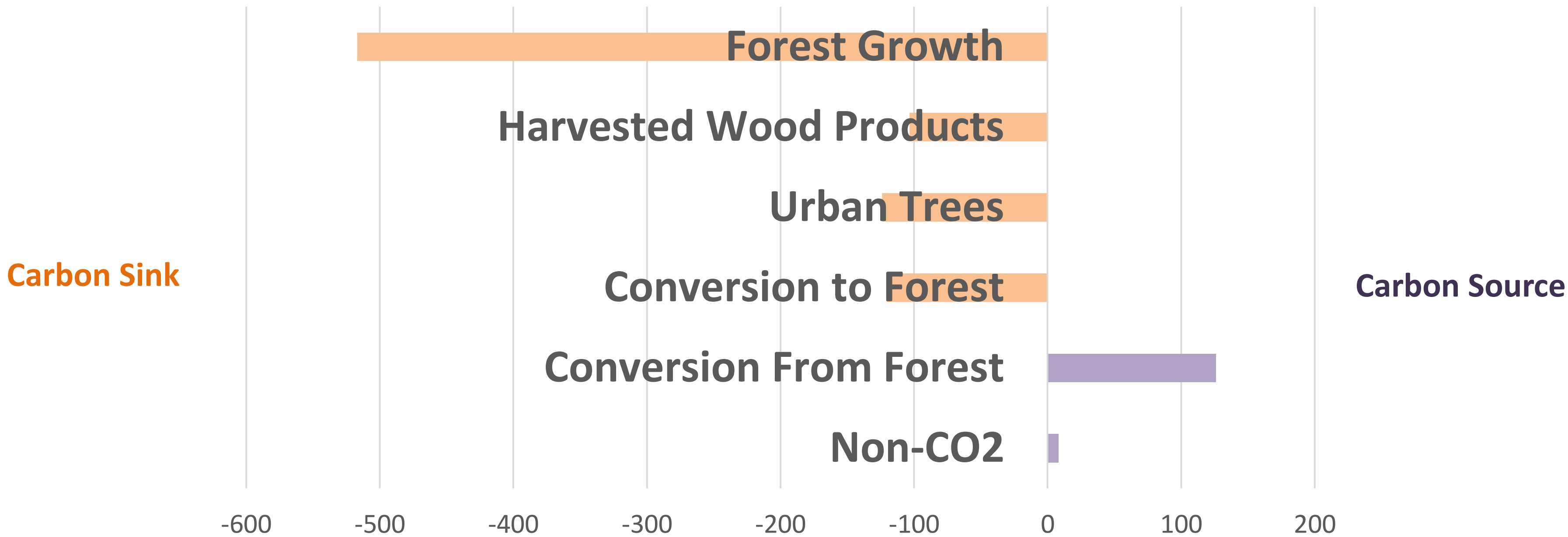
U.S. Forest Carbon Inventory (U.S. EPA, 2019)

U.S. Forest Carbon Sink = 14.88% of CO2 from Fossil Fuels



	Non-CO2	Conversion From Forest	Conversion to Forest	Urban Trees	Harvested Wood Products	Forest Growth
Series 1	8.1	126.1	-120.6	-123.9	-103.3	-517

Our Forest Carbon Sink Is Working!

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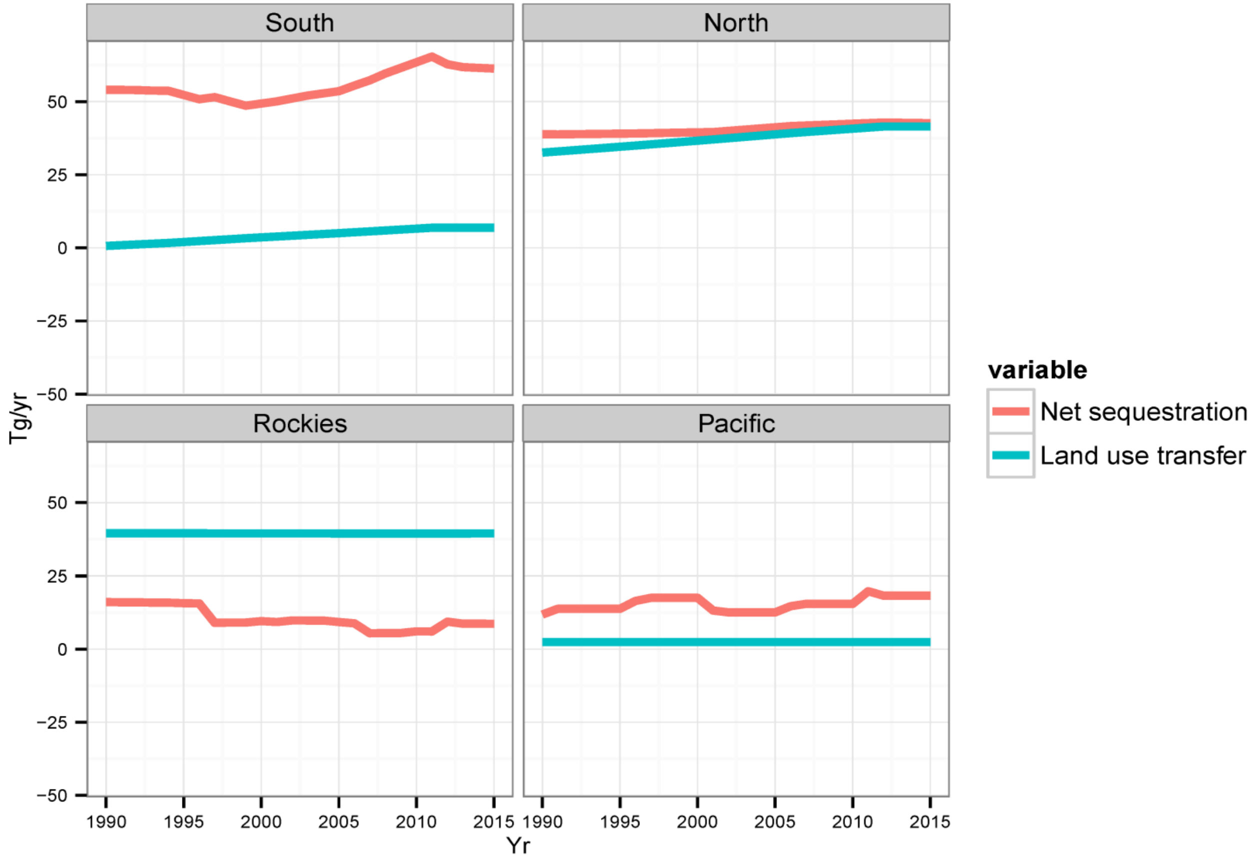
FOREST CARBON 1990-2015

80 Percent of Net Sequestration in Eastern Forests



East = Forest Carbon Powerhouse

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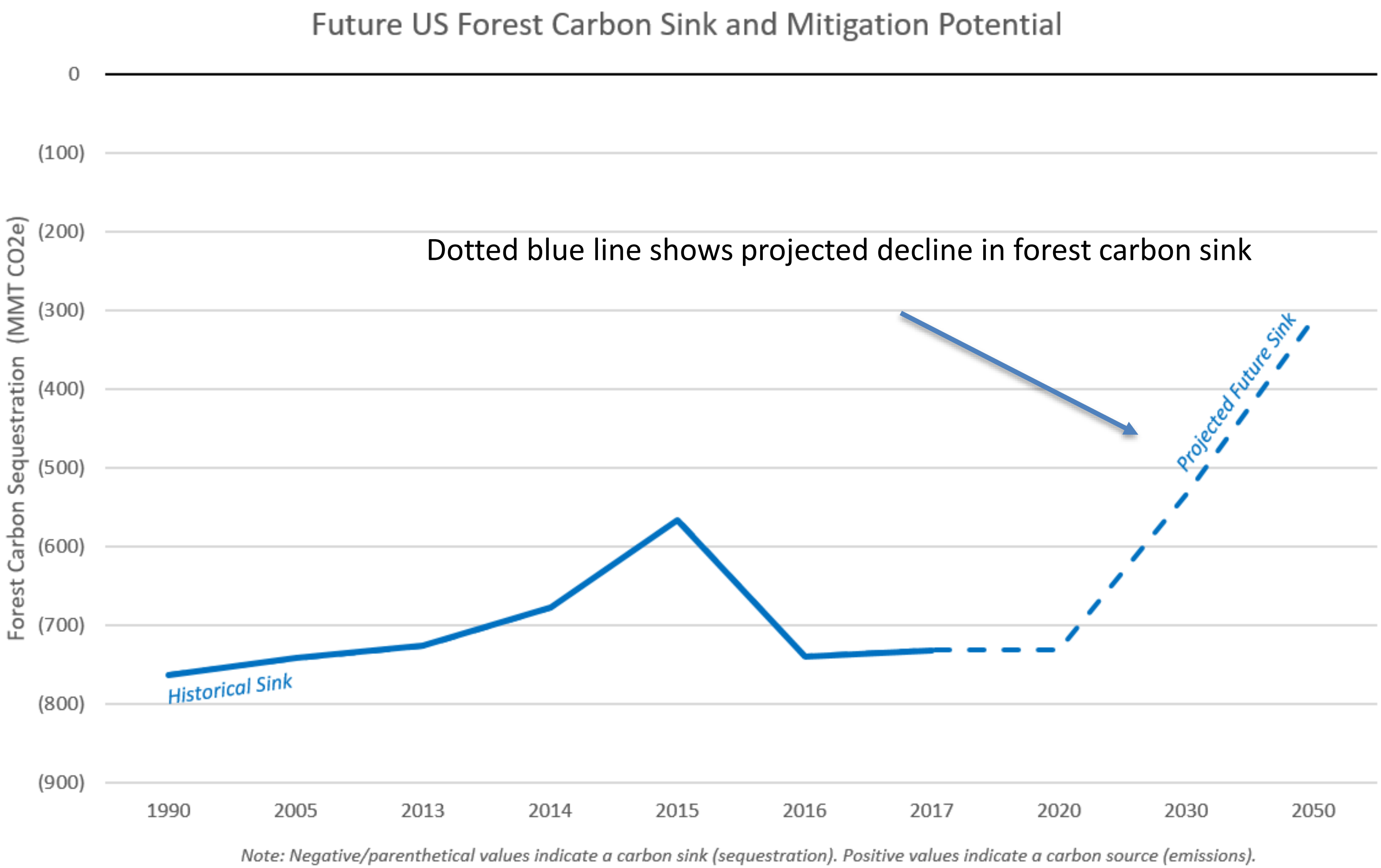

Source: U.S. Department of Agriculture, 2016. Integrated Projections for Agriculture and Forest Sector Land Use, Land Use Change, and GHG Emissions and Removals: 2015-2060.

Unless We Act, USDA Projects Declining Sink

Key Drivers Include Development & Forest Health

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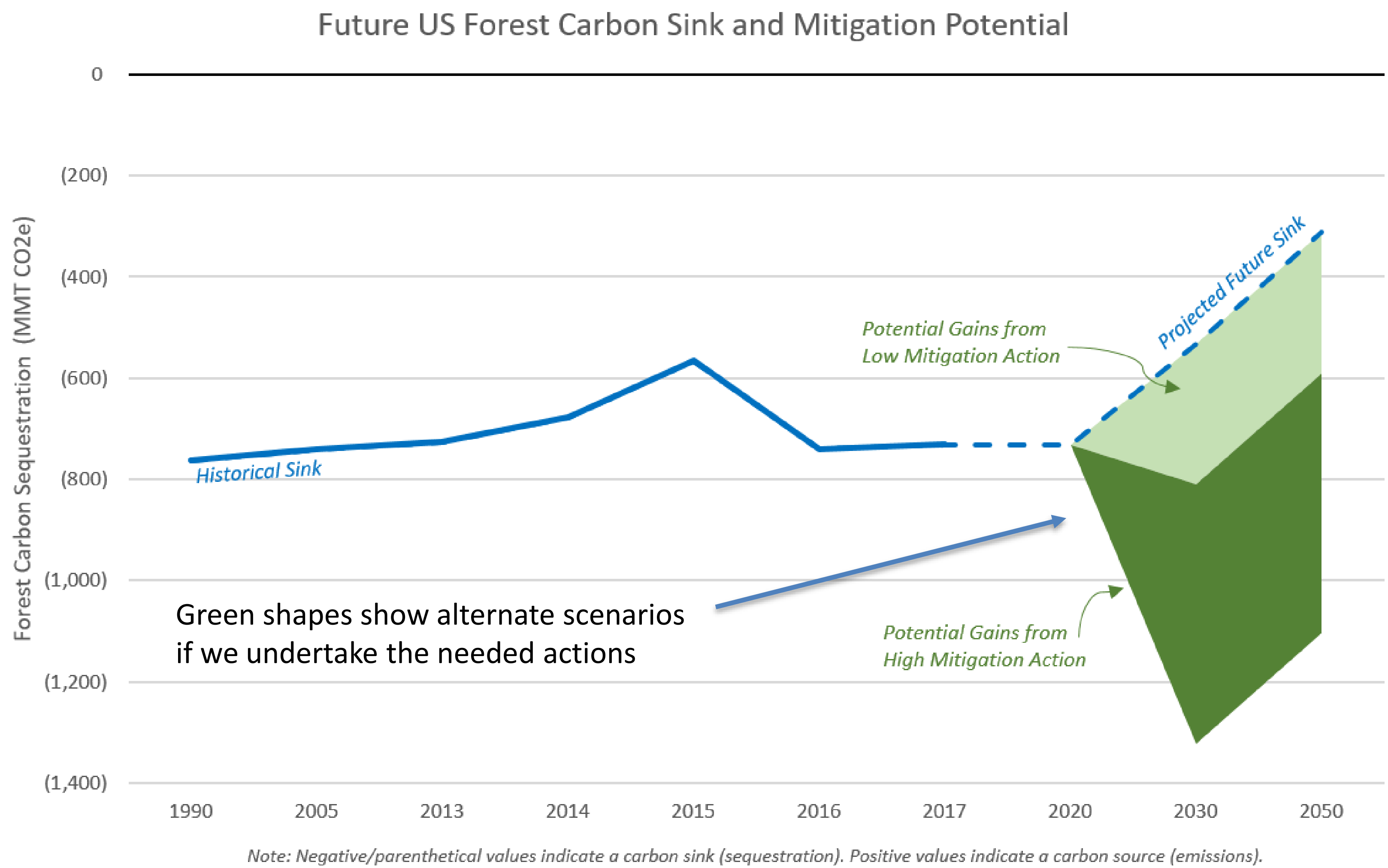

Potential Gains Can Overcome Downward Trend

Will Require New Policies and Investment

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Need Carbon Offense + Carbon Defense!

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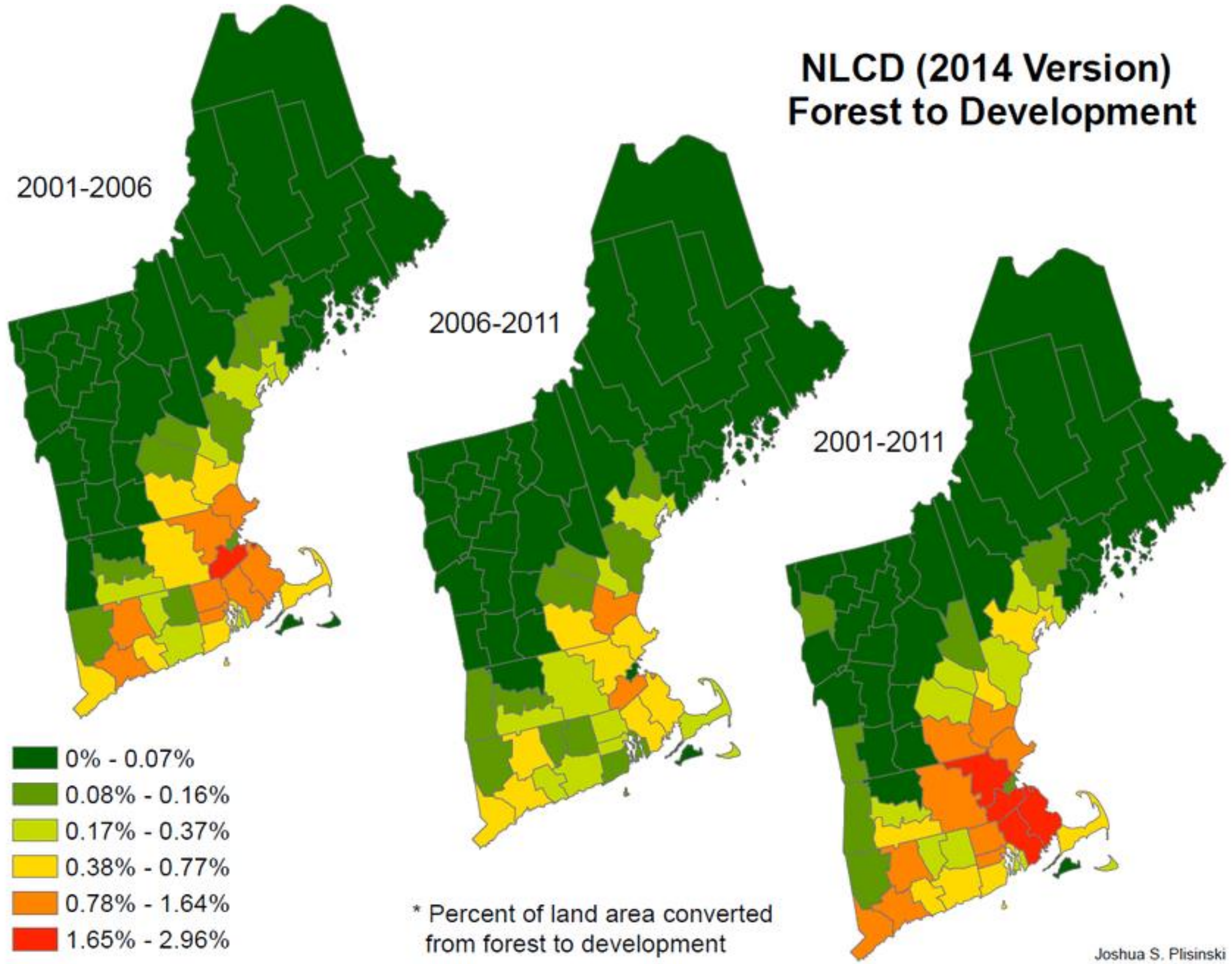

Starts with Conserving Forests

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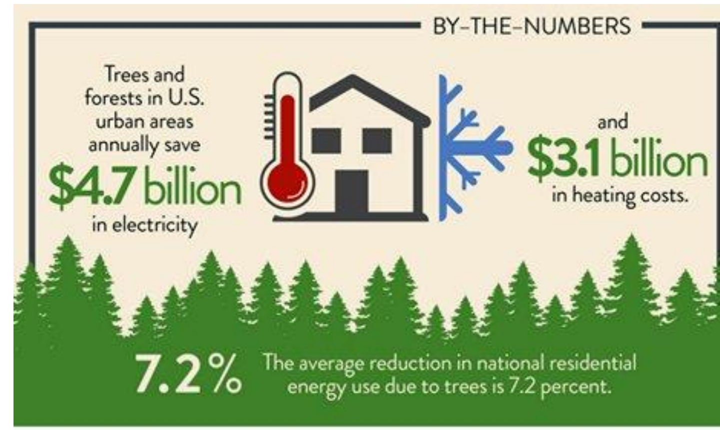

Forest Service
Research and Development
Highlights from the World Leader in Forestry Research

Plant Trees—Especially Urban Forests

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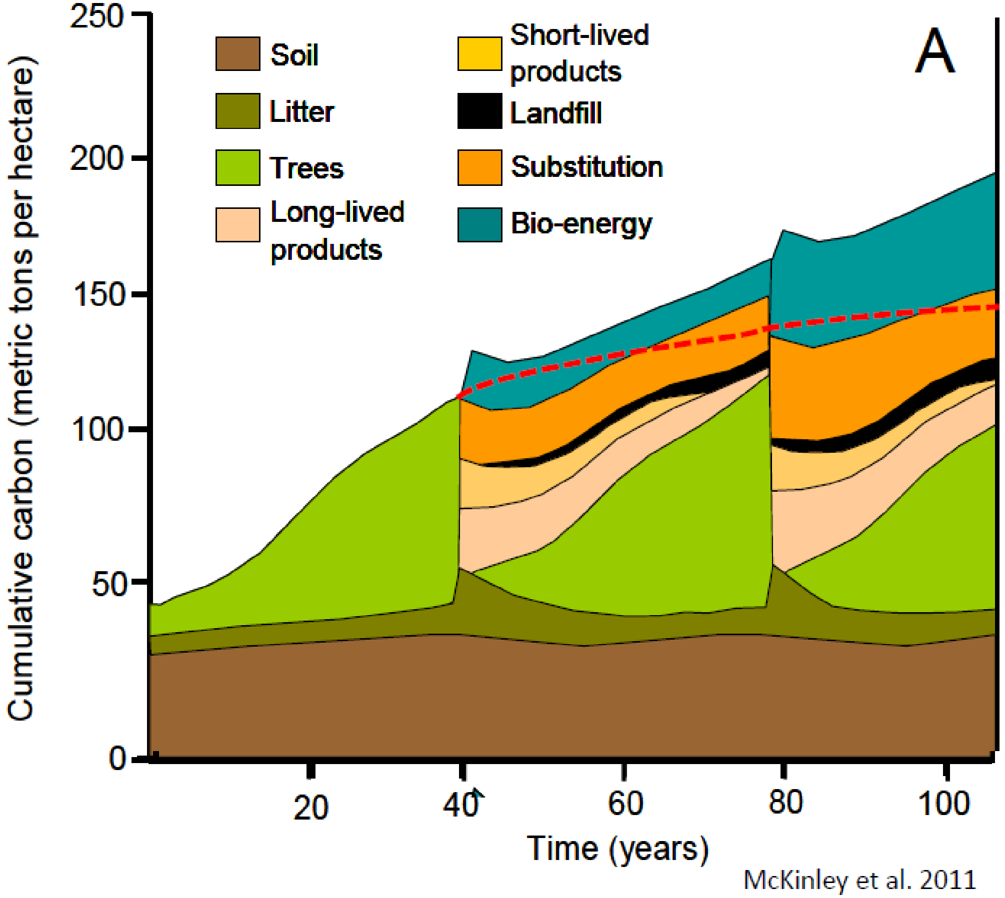

- Dotted red line shows carbon sequestration and storage absent harvest.
- Demonstrates how leveraging carbon storage and substitution benefits of diverse forest products can potentially increase total climate mitigation delivered from a particular forest.
- This modeling will produce different results depending on forest type and other context. Therefore, it should not be interpreted as predicting this result in every forest system.

Source: McKinley et al. 2011. A synthesis of current knowledge on forests and carbon storage in the United States.

Active Management Can Help

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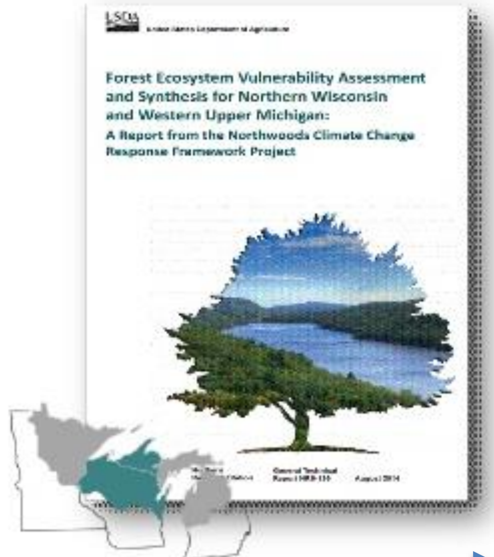
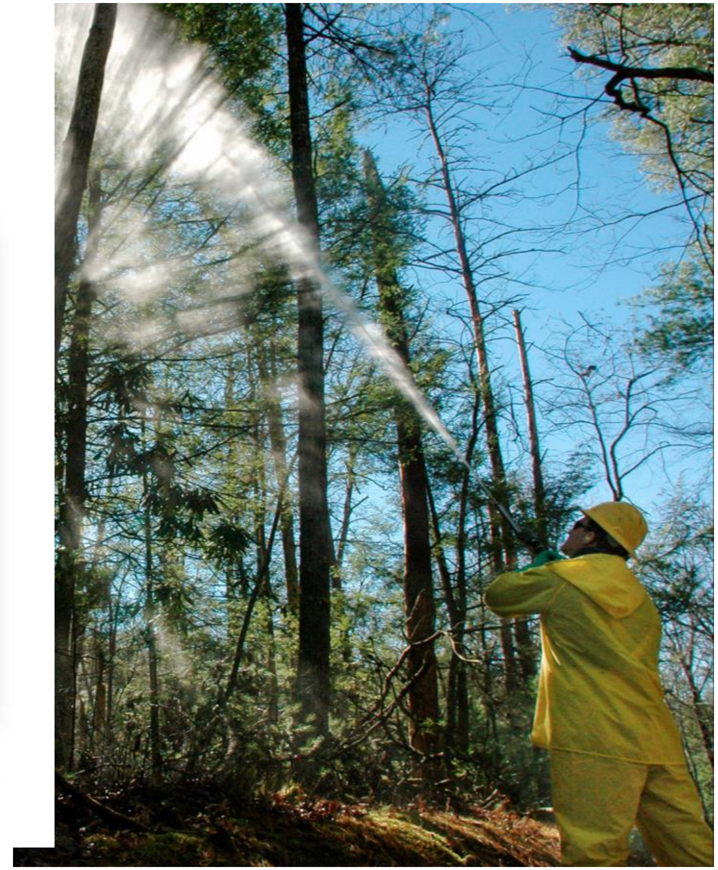
Climate Change Impacts

Regional Ecosystem Impacts

1) Longer growing season
2) Less snow, more rain
3) Altered soil moisture
4) Potential for summer drought
5) Extreme events
6) Species range shifts
7) Invasive plants
8) Forest pests and diseases





Forest Adaptation = Carbon Defense

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(fvz062, https://doi.org/10.1093/jofore/fvz062)

Practitioner's Menu of Adaptation Strategies and Approaches for Forest Carbon Management

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Strategy 6: Maintain or enhance existing carbon stocks while retaining forest character

6.1 Increase structural complexity through retention of biological legacies in living and dead wood
6.2 Increase stocking on well-stocked or understocked forest lands
6.3 Increase harvest frequency or intensity due to greater risk of tree mortality
6.4 Disfavor species that are distinctly maladapted
6.5 Manage for existing species and genotypes with wide moisture and temperature tolerances
6.6 Promote species and structural diversity to enhance carbon capture and storage efficiency
6.7 Use seeds, germplasm, and other genetic material from across a greater geographic range

Examples of adaptation tactics are:

- Forest management practices that emulate aspects of disturbance, such as variable density treatments
- Smaller, more frequent management interventions to encourage the development of multiple age cohorts or greater species diversity
- Silvicultural treatments that encourage diverse regeneration of native species, such as larger patch cuts
- Using salvage methods that create desired residual stand structures following disturbance

New Menu Guides Offense + Defense

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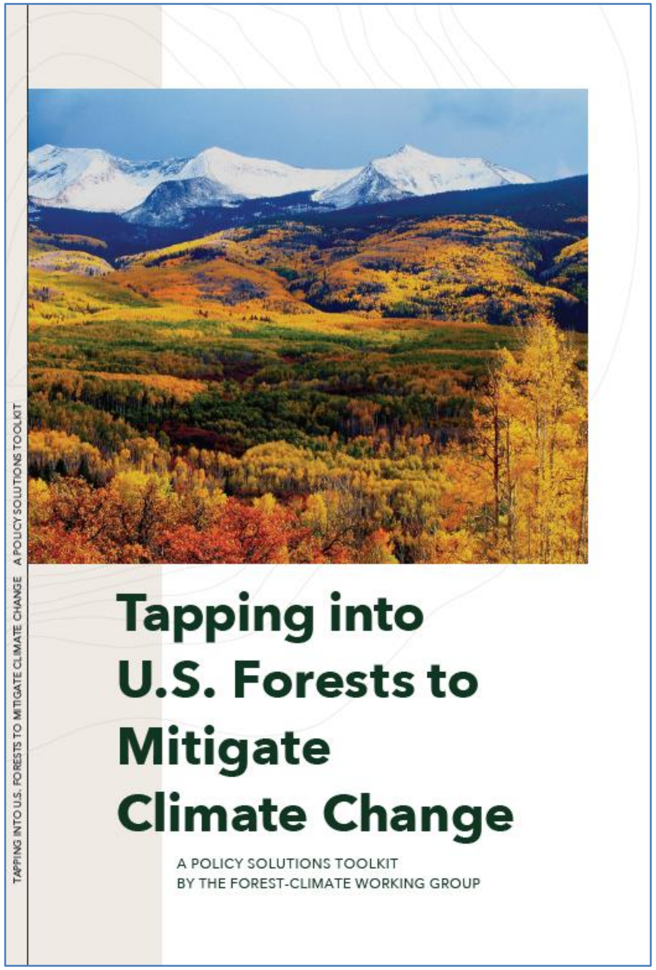

http://forestclimateworkinggroup.org/resource/tapping-into-u-s-forests-to-mitigate-climate-change-a-policy-solutions-toolkit-2019/

- Compliance and voluntary offsets
- Carbon incentive programs
- Tax incentives
- Conservation grants
- Public land management
- Climate technical assistance
- Promoting markets for key forest products
- And much more…

All of the Above Policy Approach

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Policy Design Parameters	Offsets	Incentives
Compensation is paid on basis of…	Verified GHG outcomes	# of acres enrolled by practice
Monitoring requirements	Detailed monitoring at project level	Statistical sampling across all activities
Quantification outcomes	Precise quantification at project level	Estimated results by project & program
Administrative burden	High upfront costs High review costs	High upfront costs Lower review costs
Transaction costs for participants	Higher	Lower
Eligible practices	Limited	Broader
Landowner participation	Limited to larger acreage	More flexible in scale

Look for Policy Efficiencies

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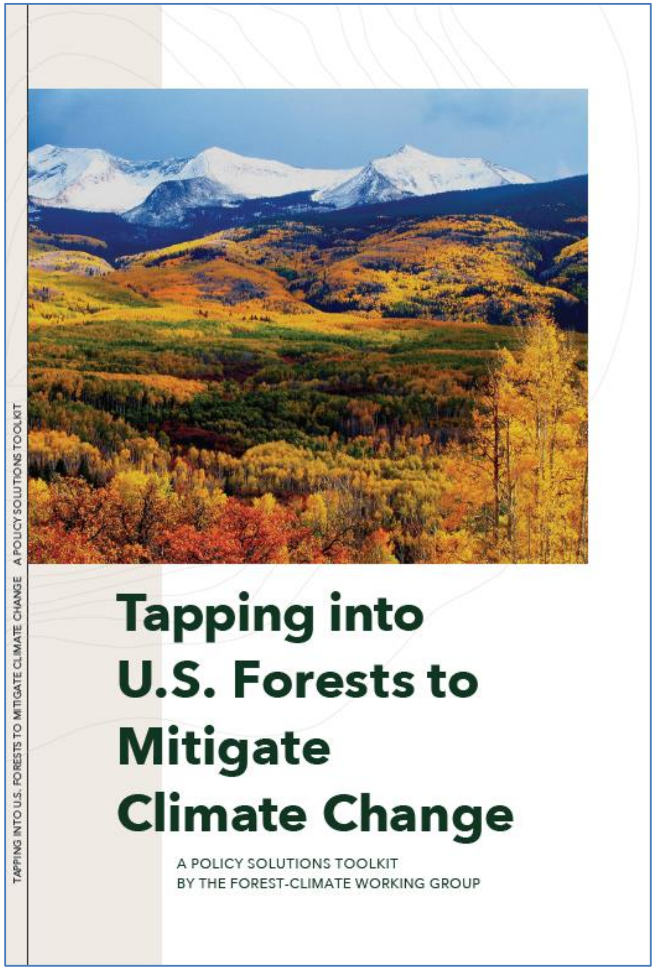

Chapter 3: Incentive Program Template

Revenue Stream

Program Administration

Eligible Practices

Compensation Rates

Contract Lengths

Reversal / Non-Performance Rules

Incentivize Co-Benefits

Review Programmatic Outcomes (and Adjust)

Our Model for Practice-Based Incentives

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Carbon Offense:
Atlantic white cedar restoration

Carbon Defense:
Pinelands wildfire risk reduction

State Funding:
NRD Funds
RGGI Proceeds

Don’t Forget Public Lands

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ELSEVIER

Effects of land use and forest management on soil carbon in the ecoregions of Maryland and adjacent eastern United States

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ABSTRACT

The impacts of forest-related land use and management on soil organic carbon (SOC) stocks have been investigated through years of primary research and review articles. This attention is justified given the importance of land use and management to greenhouse gas mitigation, soil and forest productivity, and other ecosystem services. However, there is a gap of scale and scope between site-level studies that control for sources of variation, producing high-confidence results for limited locations, and the broad reviews that offer more general conclusions. The present analysis is intended to fill that gap. Here, we focus on six ecoregions of the eastern United States, and integrate meta-analysis of published literature with synthesis of geo-referenced soil observations to: (1) test whether common land use and management practices quantitatively impact SOC; (2) identify key sources of variation in these effects; (3) assess how sources of variation translate to decisions about land use and management at ecoregional to landscape levels. Results corroborate general trends, such as O horizon SOC losses with harvesting and fire and SOC gains during reforestation, but provide greater detail about the influence of specific practices and site-level controls on SOC stocks and change in the study region. Results also show that: (1) harvest impacts depend upon landform and soil taxonomy; (2) harvesting forests that are recovering on previously cultivated lands decreases SOC; (3) tree biomass and SOC recovery increase concurrently during reforestation; (4) specific harvest, site preparation, and fire management practices affect the magnitude and variability of changes in SOC. Perhaps more importantly, ecoregional classification and soil taxonomy provide spatial frameworks for placing quantitative estimates of SOC stocks and changes in the geographic context of the study region, providing greater detail and specificity for individuals and institutions concerned with SOC management at more localized levels.

1. Introduction

Individuals and institutions concerned with land and soil management have long known that soil organic matter (SOM), which is primarily comprised of soil organic carbon (SOC), is critical to agricultural and forest productivity and myriad other ecosystem services (Vance, 2000). More broadly, the central roles played by soils in greenhouse gas mitigation are acknowledged in greenhouse gas reporting and policy (Domke et al., 2017; Griscom et al., 2017; Minasny et al., 2017). Unfortunately, there is a wide gap in scale and scope between such high-level national and global reviews and the SOC assessments needed to inform decision making at sub-regional, landscape, and project levels. Broad reviews provide general answers to critical questions, such as the distribution of SOC stocks and their sensitivity to management at large scales (Jobbagy and Jackson, 2000; Ogle et al., 2005; Nave et al., 2010; Scharlemann et al., 2014). However, land owners, forest managers, policy and reporting professionals often need information for specific locations, where generalizations (Achat et al., 2015) frequently break down (Clarke et al., 2015; Vance et al., 2018). In such cases, targeted synthesis of empirical data provides a way to assess SOC management under the geographic, land use, and management constraints present in the regions, landscapes, and projects where decisions are implemented.

The ecoregions of Maryland, which extend into adjacent states from the Mid-Atlantic down to the Southern Appalachians, are home to some of the most biologically diverse forests, wide-ranging soils, and complex physiography in the U.S.A. (Butler et al., 2015; Butler-Leopold et al., 2018). Complex topography at ecoregional to landscape levels drives corresponding variation in climate, vegetation, and soil. These sources of geographic and ecologic variation interact with a large and patchily distributed population, such that its history of land use, abuse, and management is also a history of soil change. Through agriculture and fire, Native Americans impacted the soils and ecosystems of the Central Appalachians and Mid-Atlantic for at least centuries before Euro-American colonization (Fesenmyer and Christensen, 2010; Springer et al., 2010). During the centuries following Euro-American colonization, more widespread deforestation, cultivation, and a lack of soil

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Weyerhaeuser

Push New Horizons Like Forest Soil Carbon

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