



# Natural and Working Lands and Climate Action:

## A State Guide to Enhance the Sector's Contribution to State and National Climate Goals

UNITED STATES  
CLIMATE ALLIANCE

2022

# Goals of this Resource

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1

Provide guidance on how to integrate and fortify the role of the natural and working lands (NWL) sector in achieving state and national climate goals and targets for US Climate Alliance (USCA or Alliance) member states,

2

Support Alliance states in setting NWL goals and targets in service of reaching state net-zero or other economy-wide targets,

3

Accelerate the implementation of NWL pathways (policies, practices, and programs) concurrent with goal and target setting, and

4

Catalyze increased ambition and, together with other Alliance support and external resources, help galvanize state climate action.



# Table of Contents

PART	TOPIC	OBJECTIVE
1	<a href="#">Executive Summary and Guide Overview</a>	Introduce the issue and resource
2	<a href="#">Introduction—US Climate Alliance and Climate Action</a>	Provide an overview of USCA's commitment to advancing ambitious climate action
3	<a href="#">The Role of NWLs in Climate Action</a>	Examine the role NWLs are slated to play in meeting climate goals and targets
4	<a href="#">Foundational Principles and Strategies to Enhance the Contribution of NWLs to Climate Goals</a>	Communicate key steps to fortifying the role of NWLs in reducing GHG emissions and increasing carbon sequestration and storage; share case studies that illustrate how Alliance states have integrated NWLs into climate action
5	<a href="#">NWL Climate Action: Implementation Case Studies</a>	Share case studies that highlight pathways (policies, practices, and programs) states have pursued to enhance the role of NWLs in achieving climate goals
6	<a href="#">Conclusion, Next Steps, and Additional Resources</a>	Review key takeaways, discuss next steps, and provide additional resources

# Acknowledgements

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We are grateful to the individuals who contributed to the development of this resource. Lily Colburn, Policy Analyst at the US Climate Alliance and Jenn Phillips, Senior Policy Advisor at the US Climate Alliance, led this work. The US Climate Alliance Secretariat informed and supported this resource.

The process of creating this Guide involved engagement with each Alliance state's natural and working lands (NWL) team, meetings with a state advisory committee, and frequent collaboration with the USCA NWL Working Group. Louise Bedworth, Executive Director, Center for Law, Energy and the Environment, Ashley Conrad-Saydah, Founder and Principal, Sowing Change Strategies, and Claire Jahns, Founder and Principal, Scale Consulting, provided early guidance on the scope of this resource. US Climate Alliance Impact Partner organizations (American Farmland Trust, American Forests, Soil Health Institute, The Nature Conservancy, Trust for Public Land, and World Resources Institute) reviewed and provided feedback throughout the development of this resource, as did Pew Charitable Trusts and the Nicholas Institute for Energy, Environment, and Sustainability. Special thanks to Andrea Raschke for supporting the design of this resource.

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# 1. Executive Summary

[The Issue](#)

[This Resource](#)



# Executive Summary

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## The Issue

To meet the goals of the Paris Agreement and limit warming to below 1.5 degrees Celsius, global greenhouse gas (GHG) emissions must be dramatically reduced and reach net-zero early in the second half of the century ([IPCC, 2021](#)). In support of this goal, many countries have set GHG reduction and net-zero emissions targets—ambitious goals that balance reducing anthropogenic emissions and increasing carbon sequestration (through both natural and technological approaches).

The natural and working lands (NWL) sector includes forests and woodlands, grasslands and shrublands, croplands and rangelands, wetlands and urban green spaces. NWLs play a key role in the global carbon cycle, contributing both to GHG emissions, as well as GHG reductions and removals. NWL is a unique sector due to its ability to store carbon in plants and soils, providing carbon sinks, and protect and enhance the well-being of communities, economies, and ecosystems.

NWLs sequester approximately 714 Million Metric Tons (MMT) a year, equivalent to approximately 12 percent of annual US GHG emissions ([EPA, 2019](#)).

NWLs are one of the most cost-effective and enduring solutions to the climate crisis. However, NWLs are not a guaranteed carbon sink—land use change, wildfires, insect infestations, and extreme weather are among the many factors that degrade and threaten NWLs. To capture the full potential of the NWL sector, states should set strategic near- and long-term goals/targets to reduce GHG emissions from NWLs and to maximize the carbon sequestration and storage potential of the sector.



# Executive Summary

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## The Issue

The United States Climate Alliance (USCA) is a bipartisan coalition of 24 governors working together to achieve the goals of the Paris Agreement and keep temperature increases below 1.5 degrees Celsius.

In 2021, the United States rejoined the Paris Agreement, established a Nationally Determined Contribution to reduce net GHG emissions by 50-52 percent by 2030, and the Department of State and the United States Executive Office of the President released a [national strategy](#) to reach net-zero GHG emissions by 2050.

In 2021, the US Climate Alliance committed to an Alliance-wide net-zero emissions target:

“In response to the urgent threat of climate change, we commit to reduce our collective net GHG emissions at least 50-52 percent below 2005 levels by 2030 and collectively achieve overall net-zero GHG emissions as soon as practicable and no later than 2050. We will pursue a suite of climate policies to reduce and sequester GHG emissions across all sectors to meet or exceed these ambitious targets” ([USCA 2021](#)).



# Executive Summary

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## This Resource

Many Alliance states include NWLs in their GHG mitigation goals and climate policies (statutory and/or executive actions). However, many questions and challenges remain about how states can integrate and enhance the role of NWLs in meeting net-zero and other economy-wide targets.

As Alliance states continue to be leaders on climate action, this resource offers sector-specific guidance on how to integrate NWLs into state climate goals/targets to enhance the role of the sector in both mitigating and adapting to climate change while centering equity, environmental justice, and a just economic transition in states' efforts to achieve their climate goals and create high-quality jobs ([2021-2025 USCA Strategic Plan](#)).





# Executive Summary

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## This Resource



This Guide aims to address the questions and challenges states are facing about the role of NWLs in state-wide climate action strategies, including:

What is the value of setting a NWL goal/target? How can a NWL goal/target catalyze and support climate action?

How are different goals and targets, including net-zero, defined?

How can states manage the inherent uncertainty and complexity of NWLs while still including the sector in net-zero/GHG reduction goals?

What are key NWL pathways (policies, practices, and programs) that states can pursue in the absence of robust data and modeling results, and how can states incorporate these actions into climate goals/targets?



# Executive Summary

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## This Resource



### Audience

This Guide was developed to support all Alliance states grappling with questions and challenges about how to enhance the role of NWLs in state climate strategies.



### Process

**Listening to states.** This resource was informed by interviews with each Alliance state's NWL team, convenings of the NWL Working Group, and an advisory committee of state NWL experts.

**Soliciting expert ideas.** Alliance staff consulted an external advisory committee of NWL experts to ensure this Guide is reflective of the best available science and can support all Alliance states that are seeking to enhance the contribution of NWLs to state and national climate goals.

**Reviewing resources.** This Guide draws on and integrates published research, including from state climate action plans, NWL plans, and decarbonization plans, as well as research produced by non-governmental organizations (NGOs), state and federal government agencies and departments, and academic journal articles.



### Structure

This Guide contains six parts, with each section building on each other and shared information referenced throughout. The resource can be read as a report from start to finish, or readers can focus on specific sections that are of interest to them. Each part of the Guide begins with a "Section Overview" and concludes with "Key Takeaways."

## 2. United States Climate Alliance and Climate Action

[Section Objective and Overview](#)

[Introduction](#)

[The Role of Goals and Targets](#)

[Key Takeaways](#)

## Part 2: US Climate Alliance and Climate Action

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### Section Objective and Overview



#### Section Objective:

- Provide an overview of the US Climate Alliance's commitment to advancing ambitious climate action



#### Section Overview:

- The United States Climate Alliance (USCA) is a bipartisan coalition of 24 governors working together to achieve the goals of the Paris Agreement and keep temperature increases below 1.5 degrees Celsius.
- Transparency and accountability guide the work of the Alliance as it tracks, evaluates, and shares progress made in support of ambitious climate goals/targets.
- Climate goals/targets establish transparent and measurable objectives and are an essential component of advancing and achieving sustainable and equitable climate action.
- Alliance states have set ambitious economy-wide and sector-specific climate goals/targets to meet the objectives of the Paris Agreement.



# United States Climate Alliance

## Introduction

The United States Climate Alliance (USCA or Alliance) is a bipartisan coalition of 24 governors working together to achieve the goals of the Paris Agreement and keep temperature increases below 1.5 degrees Celsius. Over five years, the Alliance has grown to represent every region of the country.

### COLLECTIVELY, THE ALLIANCE REPRESENTS:

- 58 percent of the US economy
- 54 percent of the US population
- 41 percent of US GHG emissions

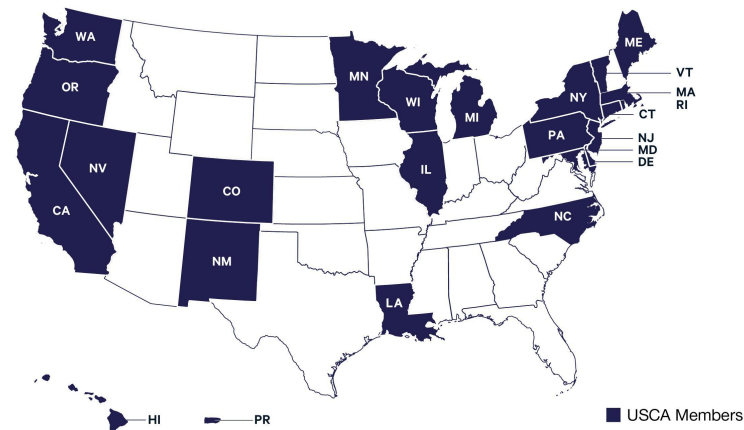


Figure 1: Map of USCA member states

**USCA member states are reducing GHG emissions**, accelerating climate action and policies, building resilience to the impacts of climate change, and promoting clean energy deployment at the state and federal level.

**Transparency and accountability** guide the work of USCA as the coalition tracks, evaluates, and shares progress made towards Alliance goals in national and international settings (for additional information see [USCA Strategy 2021-2025](#)).

# United States Climate Alliance

## Introduction

Between 2005 and 2020, the policies and actions put in place by Alliance states reduced collective net GHG emissions by 24 percent ([USCA Annual Report, 2022](#)).

At the same time, Alliance states delivered more co-benefits for their communities compared to the rest of the country, including lower levels of air pollution, more clean energy jobs, and larger amounts of energy savings for households and businesses ([USCA Annual Report, 2022](#)).

While GHG emissions levels are estimated to continue to rise slightly as the nation recovers from the economic downturn caused by the COVID-19 pandemic, the Alliance's 2025 GHG emissions target remains within reach (26-28 percent below 2005 levels) ([USCA Annual Report, 2022](#)).

## USCA Climate Actions and Counts

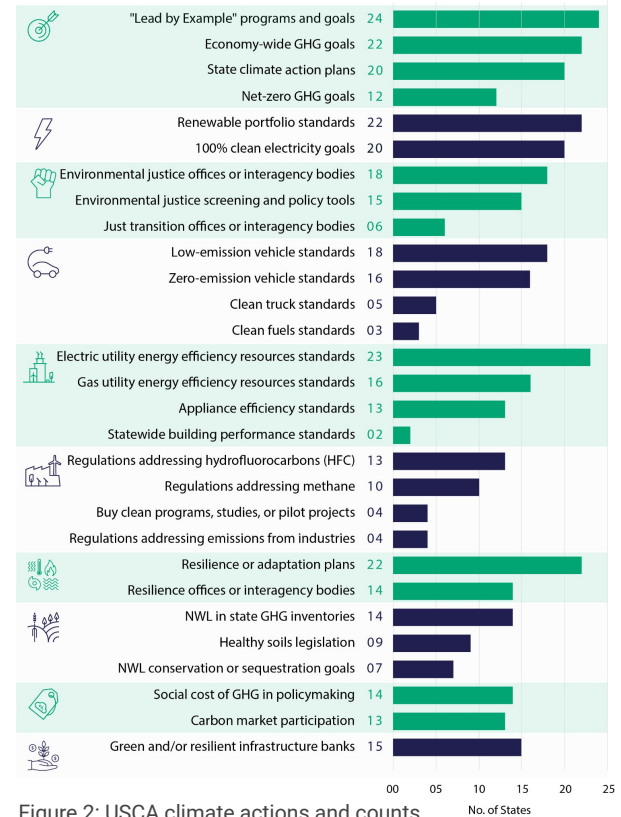


Figure 2: USCA climate actions and counts

Source: [USCA Fact Sheet, 2022](#)

# The Role of Goals and Targets



Goals/targets establish transparent and measurable objectives and are a critical part of advancing and achieving sustainable and equitable climate action.

## Key Characteristics of Effective Climate Goals/Targets:

- 1 Transparent scope (economy-wide or sector-specific)
- 2 Baseline year (the year that the target is being compared to)
- 3 Clear Timeline (short-term, medium-term, long-term)
- 4 Opportunities to recalibrate ambition and improve goal/target
- 5 Durable (e.g., established through statutory action or legally binding executive action)
- 6 Mechanisms to track, evaluate, and share progress (see [Foundational Principle 4](#)) as well as opportunities to improve these metrics

Economy-Wide Target*	Definition
Net-Zero/Carbon Neutral	"A balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases" (Paris Agreement)
Net-Negative	GHGs removed from the atmosphere exceed GHGs emitted
GHG Emissions Reduction	Quantitative target that establishes a specific goal/target to reduce GHG emissions

\* Each state often has its own definition for climate goals/targets, which is usually defined in the legislation that establishes the goal/target.



# The Role of Goals and Targets

## Examples of US Climate Alliance States' Economy-Wide Goals/Targets \*

State	Action	Target Year	Carbon Neutral or Net Zero/Negative Target	GHG Emissions Limit
California	<a href="#">AB 1279</a> and <a href="#">SB 32</a>	2045	"Achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter"	40% below 1990 levels by 2030
Hawai'i	<a href="#">HB 2182 (Act 015)</a>	2045	Aims for carbon negative: "a statewide target is hereby established to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045"	1990 level by 2020
Maine	<a href="#">LD 1429</a>	2045	"Beginning January 1, 2045, net annual greenhouse gas emissions may not exceed zero metric tons"	40% below 1990 levels by 2030 and at least 80% below 1990 levels by 2050
New York	<a href="#">SB 6599</a>	2050	<p>"It shall therefore be a goal of the state of New York to reduce greenhouse gas emissions from all anthropogenic sources 100% over 1990 levels by the year 2050."</p> <p>"The council shall on or before two years of the effective date of this article, prepare and approve a scoping plan outlining the recommendations for attaining the statewide GHG emissions limits in accordance with the schedule established in section 75-0107 of this article, and for the reduction of emissions beyond eighty-five percent, net zero emissions in all sectors of the economy..."</p>	The law sets three reduction requirements. The statewide emission limit for 2030 is equivalent to a 40% reduction from 1990 levels and the 2050 limit is an 85% reduction. These limits refer to gross emissions and were promulgated under Part 496. The separate net zero target for 2050 refers to net emissions, as in the UNFCCC accounting. All of these reduction requirements are in 20-year GWP and include upstream, out-of-state energy emissions.

\* 14 Alliance states have net-zero/carbon-neutral targets: CA, HI, LA, MA, ME, MD, MI, NC, NV, NM, NY, RI, WA, VT

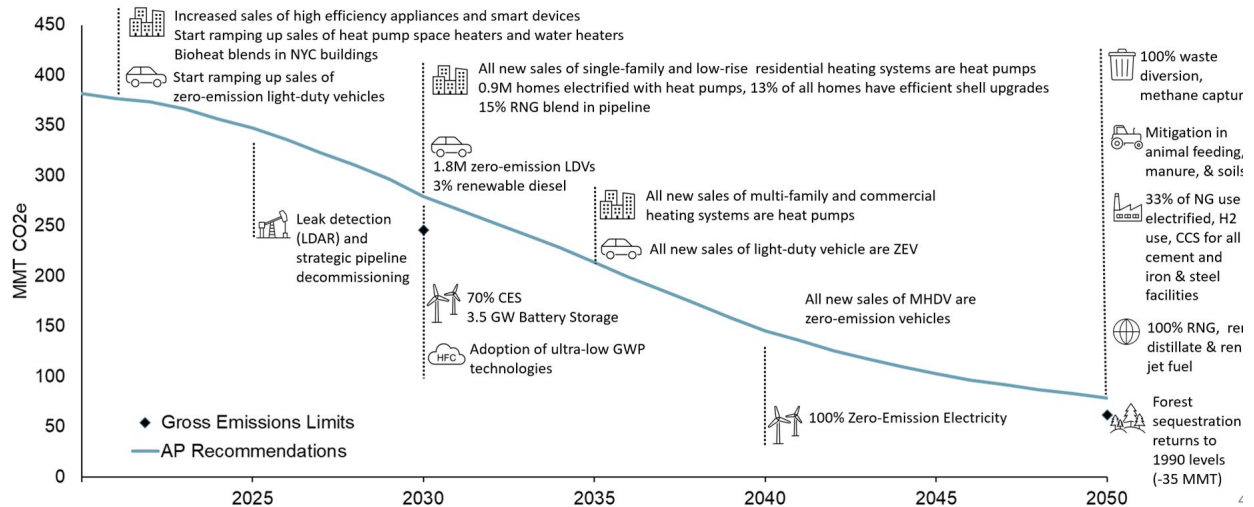


# The Role of Goals and Targets

To achieve economy-wide goals/targets, states must take a comprehensive approach and, in addition to setting economy-wide goals/targets, establish robust sector-specific goals/targets (NWL, transportation, buildings, industry, and power) to establish clear pathways (policies, practices, and programs) to achieving an economy-wide target.

## Sector-Specific Goals/Targets to Support New York's Economy-Wide Target—Advisory Panel Recommendations

For example, this analysis of the Advisory Panel's Recommendations in [New York's Draft Scoping Plan](#) demonstrate how each sector-specific goal/target will contribute to the state's economy-wide climate goals.



Source: [New York Draft Scoping Plan](#)

# The Role of Goals and Targets

## Examples of US Climate Alliance States' Sector-Specific Goals/Targets




Sector	Goal/Target	State Example(s)
NWL (additional examples on <a href="#">107</a> )	Carbon Sequestration	<a href="#">Oregon</a> : Sequester at least an additional 5MMTCO <sub>2</sub> e per year in Oregon's natural and working lands and waters by 2030, and at least 9.5MMTCO <sub>2</sub> e per year by 2050 relative to a 2010 to 2019 activity-based, business-as-usual net carbon sequestration baseline (outcome-based goal proposed in <a href="#">NWL Proposal 2021</a> )
Transportation	Zero Emission Vehicles	<a href="#">California</a> : 100% zero emission vehicles (new sales- light duty) by 2035, 100% zero emission vehicles (new sales-medium/heavy duty) by 2045 <a href="#">New Jersey</a> : 330,000 zero emission vehicles deployed by 2025 <a href="#">North Carolina</a> : 50% zero emission vehicles (new sales) by 2030
Buildings	GHG Emissions Reductions	<a href="#">Massachusetts</a> : 33% GHG reduction below 1990 levels by 2025, 50% by 2030 (residential heating and cooling)
	Climate-Friendly Housing	<a href="#">California</a> : 3 million climate-ready and climate-friendly homes by 2030 and 7 million homes by 2035
	Energy-Use Reduction	<a href="#">New York</a> : 185 TBtu energy use reduction from 2025 forecast
Industry	GHG Emissions Reductions	<a href="#">Colorado</a> : 20 percent emissions reduction below 2015 levels by 2030 <a href="#">Massachusetts</a> : reduce emissions from industrial energy use and non-GHG emissions 34 percent below 1990 levels by 2025 and 48 percent by 2030 <a href="#">Maine</a> : hold its industrial emissions "flat through 2030" and "reduce them" through 2050 <a href="#">California</a> : reduce the GHG-intensity of its cement sector 40% below 2019 levels by 2035, and achieve net zero cement by 2045 (only state to adopt a GHG goal specific to an industrial sub-sector)
Power	GHG Emissions Reductions	<a href="#">New York</a> : 100% zero emissions by 2040 <a href="#">North Carolina</a> : 70% CO <sub>2</sub> reduction below 2005 levels by 2030, 100% carbon neutral by 2050 <a href="#">Oregon</a> : 80% GHG reduction by 2030, 90% by 2035, 100% by 2040



## Part 2: US Climate Alliance and Climate Action

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### Key Takeaways

-  Alliance states are leaders on climate action across all major sectors: NWL, resilience, transportation, buildings, industry, and power.
-  Integrated economy-wide and sector-specific goals/targets are critical to mitigating and adapting to climate change.
-  Alliance states have set ambitious economy-wide and sector-specific goals/targets.

### Key Characteristics of Effective Climate Goals and Targets



Transparent



Baseline Year



Clear Timeline



Opportunities to  
Recalibrate Ambition



Durable



Mechanisms to track,  
evaluate, and share progress

# 3. The Role of Natural and Working Lands in Climate Action

Section Objective and Overview

The Role of Natural and Working Lands in Climate Action

Natural and Working Lands Goals and Targets

NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

Key Takeaways



## Part 3: The Role of NWLs in Climate Action

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### Section Objective and Overview

#### Section Objective:

- Examine the role natural and working lands (NWLs) are slated to play in meeting climate goals

#### Section Overview:

- NWLs play a key role in the global carbon cycle, contributing both to GHG emissions, as well as GHG reductions and removals.
- In the United States, NWLs are publicly and privately owned and managed for a myriad of objectives, which include the production of food and forest products, carbon sequestration and storage, tourism, open space, recreation, and private use. These management objectives influence how much NWLs emit, sequester, and store carbon.
- NWLs are critical to achieving the goals of the Paris Agreement to limit global warming to 1.5 degrees Celsius—according to the IPCC, there is no pathway to net-zero emissions by 2050 without carbon removal.
- The diversity of land types across Alliance states is immense, spanning deserts, coastal and freshwater wetlands, rangelands, urban green spaces, and more.
- Alliance states are pursuing a variety of sector-specific (NWL) goals/targets to enhance the contribution of NWLs to state and national climate goals.
- NWLs are foundational to social and cultural, environmental, and economic goals.

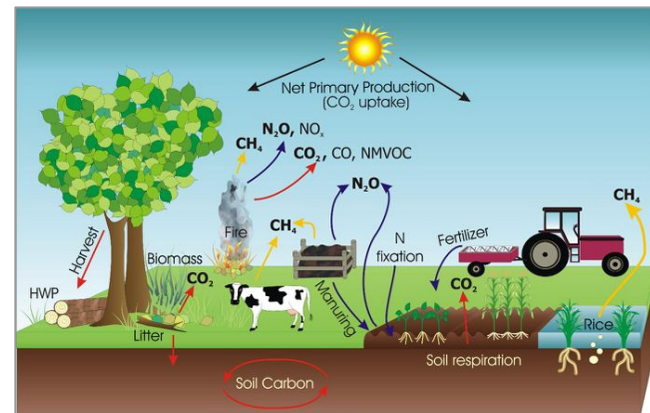
# The Role of NWLs in Climate Action

## Background

Natural and working lands (NWLs) refer to the variety of land types that make up the natural environment: forests and woodlands, grasslands and shrublands, croplands and rangelands, wetlands, and urban green spaces. NWLs produce food and fiber and are a key part of resilience and adaptation strategies. NWLs also play a key role in the global carbon cycle, contributing both to GHG emissions, as well as GHG reductions and removals.

In the United States, NWLs are publicly or privately owned and managed. Public lands are managed as a public trust by a variety of agencies for multiple goals, objectives, and outputs. States and the federal government have varying authorities over private land management. Given the patchwork of land ownership and the delegation of land use authority to local governments, to enhance the role of NWLs in state climate strategies, states need to establish mechanisms to collaborate with various levels of government and landowners, including federal and local governments, land trusts, and private landowners.

NWLs are publicly and privately owned and managed for a myriad of objectives, which include the production of food and forest products, carbon sequestration and storage, tourism, open space, recreation, and private use. These management objectives influence how much NWLs emit, sequester, and store carbon.



Source: [IPCC 2019](#)



# The Role of NWLs in Climate Action

## Background

NWLs are critical to achieving the goals of the Paris Agreement to limit global warming to 1.5 degrees Celsius: according to the IPCC, there is no pathway to net-zero emissions by 2050 without carbon removal ([IPCC, 2021](#)). As such, the United States' strategy to reach net-zero by 2050 highlights the role of NWLs in mitigating, and adapting to, climate change ([Pathways to 2050, 2021](#)).

NWL is the only sector that can naturally remove carbon from the atmosphere.

- Collectively, GHG emissions reductions from NWLs are equivalent to 12 percent of total US emissions ([EPA, 2019](#))
- Sustainable management of NWLs can increase net carbon removal—up to 30 percent of global carbon reduction needed to limit warming to 1.5 degrees Celsius ([Roe et al., 2019](#))

NWLs also provide innumerable social and cultural, environmental, and economic benefits (see slide [29](#)).

### Key Terms

<b>Carbon Source</b>	Resources that emit carbon
<b>Carbon Sink</b>	Resources that store carbon
<b>Carbon Stock</b>	Sum of all carbon pools within a defined area and time
<b>GHG Flux</b>	The rate of greenhouse gas released into (+) or removed (-) from the atmosphere from a particular source or sink per unit of land area (e.g., CO <sub>2</sub> /hectare/year)
<b>Net Emissions</b>	The sum of all GHG fluxes within a defined period and scope (e.g., net forest land emissions). NWL ecosystems simultaneously sequester CO <sub>2</sub> from the atmosphere (along with CH <sub>4</sub> and N <sub>2</sub> O emissions in some cases)
<b>Gross Emissions</b>	Total of emissions from all sectors (does not include CO <sub>2</sub> removals by NWL)

Source: Courtesy of Massachusetts Executive Office of Energy and Environmental Affairs

# The Role of NWLs in Climate Action

In 2021, the Biden Administration published the [US Long-Term Strategy \(LTS\)](#)—an analysis detailing how the US can reach net-zero emissions no later than 2050. The LTS includes an analysis of emissions reductions strategies to achieve net-zero by 2050 in the United States. This national model includes the carbon storage potential of lands.

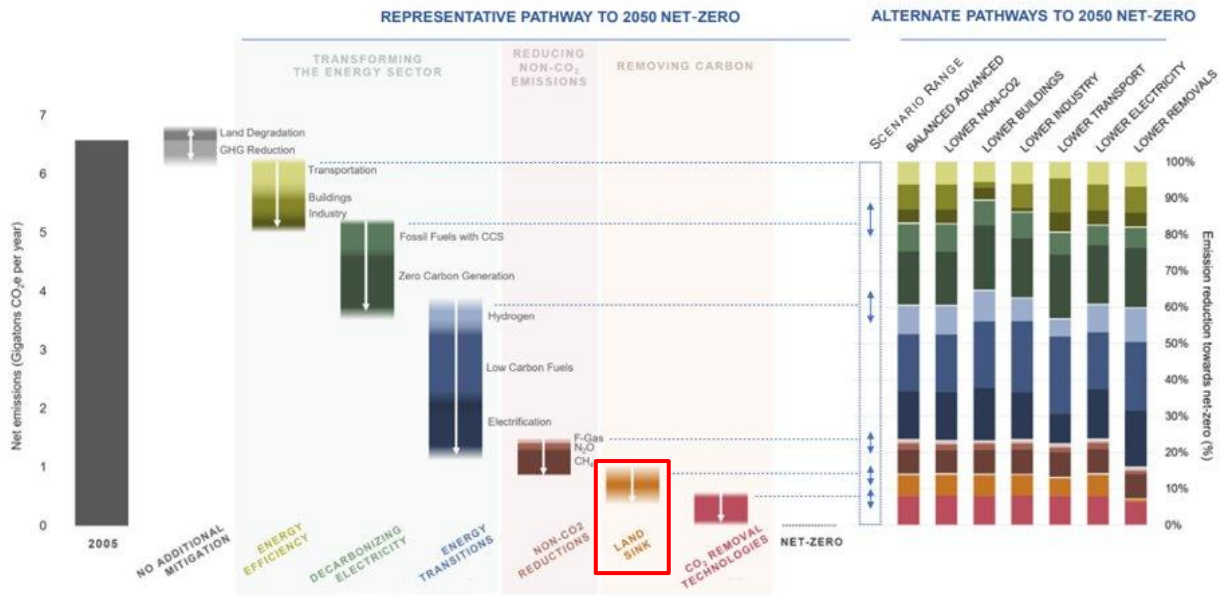
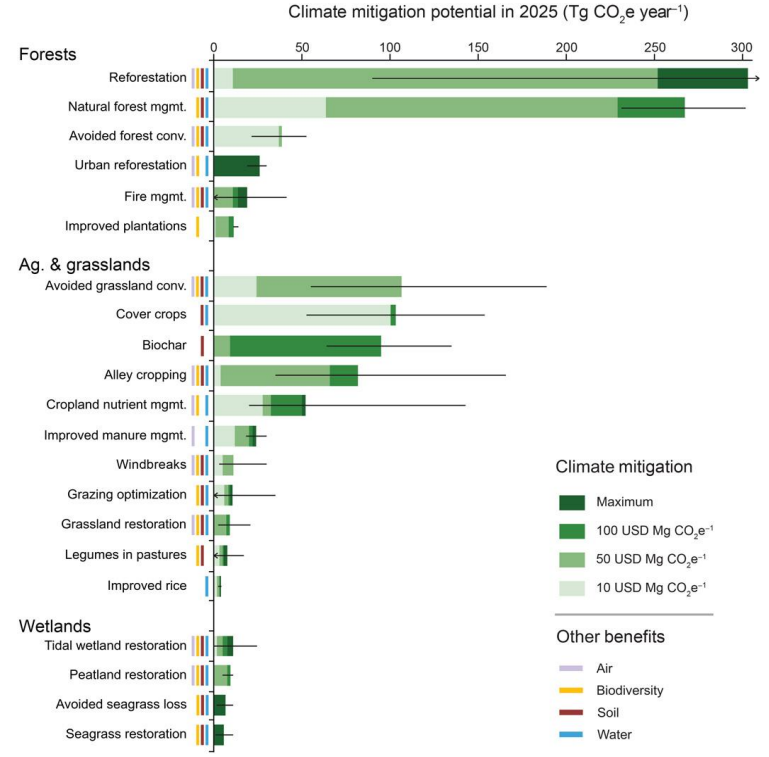


Figure 3: Emissions reductions strategies to achieve net-zero by 2050  
 Source: [US Long-Term Strategy \(LTS\)](#)



# The Role of NWLs in Climate Action

NWLs could reduce US emissions and increase removals by approximately 1 billion tons of CO<sub>2</sub> per year by 2025—equivalent to over 20 percent of US economy-wide emissions ([Fargione et al., 2018](#)). Figure 4 shows the climate mitigation potential of 21 natural climate solutions (NCS) strategies, including the estimated cost of implementation of each pathway and other benefits (air, biodiversity, soil, and water).



**Key Takeaway:** States can help achieve the goals of the Paris Agreement through NWL—both by reducing GHG emissions and increasing carbon sequestration and storage

Figure 4: Climate mitigation potential of 21 natural climate solutions (NCS)  
Source: [Fargione et al., 2018](#)



## The Diversity of NWLs across the US Climate Alliance States

The diversity of NWLs across and within Alliance states is immense, spanning deserts, coastal and freshwater wetlands, rangelands, forests, and more. Each of these ecosystems has cultural, social, environmental, and economic significance and plays a unique role in the framework of the state.

Given the diversity of ecosystems, uses of NWLs, and ownership and governance structures across the Alliance, each state will need to carefully consider its priorities and corresponding pathways (policies, practices, and programs) to mitigate and adapt to climate change. For example, coastal states may choose to explore opportunities to protect and enhance blue carbon stocks in alignment with 30x30 goals. States grappling with extreme heat may invest in increasing urban tree canopy cover to increase carbon sequestration and tree equity.



Sources (left to right): 1) [Anna Goncharova](#) 2) [Emily Kessler](#) 3) Nevada Department of Conservation and Natural Resources 4) [Bruce Wilson](#)

## NWL Goals and Targets

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Alliance states have set ambitious, sector-specific goals/targets (see slide [103](#)) and are continuously taking action to enhance the contribution of NWLs to state and national climate goals. However, there are often inconsistencies (within a single state, as well as across Alliance states) in the ways that states track, evaluate, and share progress made towards NWL climate goals/targets.

Specifically, there are key differences in the ways states include NWLs in the following:

- State climate plans,
- GHG inventories (either the state-wide GHG inventory or an NWL GHG inventory), and
- Legal inclusion of NWLs in GHG reduction goals/targets.

To more effectively track, evaluate, and share the contribution of NWLs to state and national climate goals, states should align state climate plans, inventories, and policies.



**Key Point:** Even if NWLs are not included in a state climate plan, GHG inventory, and/or GHG reductions goal/target, states can still take bold, no-regrets actions that will enhance the contribution of NWLs to state and national climate goals, as well as contribute to the state's social and cultural, environmental, and economic well-being. States should also strive to align and embed NWLs in state climate policies and programs to bolster the role of the sector in state climate action.



## NWL Goals and Targets

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Alliance states have set ambitious, sector-specific goals/targets to enhance the contribution of NWLs to state and national climate goals. Some examples of shared practices and goals Alliance states have adopted are highlighted below. For additional information on NWL goals/targets see slides [102-103](#).

### Examples of US Climate Alliance States' NWL Goals/Targets

US Climate Alliance States have adopted or are in the process of adopting the following:	Number of States	States
<b>Natural and Working Lands in State GHG Inventories</b>	15	CA, CO, DE, HI, ME, MD, MA, MN, NV, PA, NM, NC, NJ, NY, VT, WA, WI
<b>Healthy Soils Legislation</b>	10	CA, CO, HI, IL, ME, MD, NM, NY, VT, WA
<b>Conservation or Sequestration Goals, including 30x30</b>	9	CA, CO, DE, HI, MA, ME, MI, MD, NM, OR, WI



## NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

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Climate change is already having significant impacts around the world, with disproportionate impacts on low income and disadvantaged communities. As such, in addition to playing a critical role in achieving the goals of the Paris Agreement, the foundational role of NWLs in supporting social and cultural, environmental, and economic well-being must not be overlooked: research shows that investment in NWLs for climate mitigation and adaptation can not only reduce GHG emissions and increase carbon sequestration, but can also enhance water quality, create jobs, reduce flood and fire risk, and much more. For example, urban tree planting initiatives can increase carbon sequestration and storage, bolster resilience, create jobs, reduce stormwater runoff, improve air quality, and enhance green spaces (see [implementation case studies](#)).

The following case studies (slides [31-36](#)) exemplify how NWLs contribute to social and cultural, environmental, and economic well-being. Although the case studies are not comprehensive, they communicate some of the many ways that NWLs improve human health, bolster economies, foster a sense of identity and belonging, and much more.



## NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

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"We also know this crisis presents vast opportunities to build a better economy, create millions of good-paying jobs, clean our waters and air, and ensure all Americans can live healthier, safer, stronger lives" ([US Long-Term Strategy](#)).

"Climate change is already having disproportionate health and economic impacts on the poor, on racial minorities, on Indigenous Peoples, and on women and girls. Policies and programs to advance Natural Climate Solutions need to recognize the underlying causes of inequality and be designed and executed in ways that ensure a fundamental respect for human rights, enhance social and economic resilience, reduce adverse health impacts and provide economic opportunities for most vulnerable communities and individuals" ([US Nature4Climate](#)).

"Alliance members are moving beyond foundational climate policies to advance the next generation of innovative, high-impact, state-led climate actions that will result in even more significant reductions of GHG emissions while building just, equitable, and climate-resilient infrastructure, ecosystems, and communities" ([USCA Annual Report, 2022](#)).

# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

Case Study: Advancing social and cultural, environmental, and economic goals through the Maryland Conservation Corps

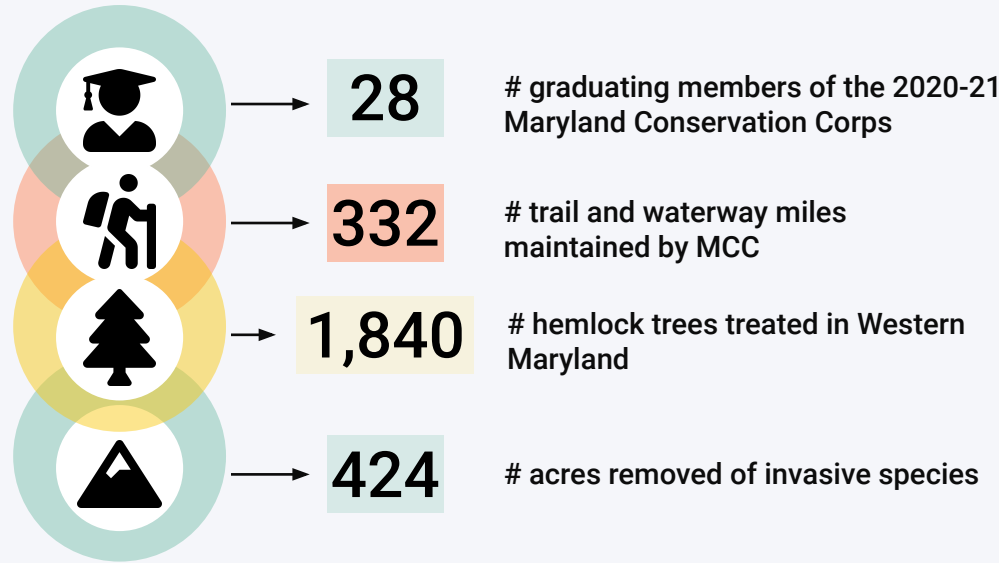






## Maryland Conservation Corps (MCC)

**2020-21 Annual Report Statistics**

**Program Goals**

- Environmental and Infrastructure Restoration
- Waterway and Trail Improvements
- Environmental Education




	→	<b>28</b>	# graduating members of the 2020-21 Maryland Conservation Corps
	→	<b>332</b>	# trail and waterway miles maintained by MCC
	→	<b>1,840</b>	# hemlock trees treated in Western Maryland
	→	<b>424</b>	# acres removed of invasive species

Learn more about MCC at their [website](#) and [2020-2021 Annual Report](#)

# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

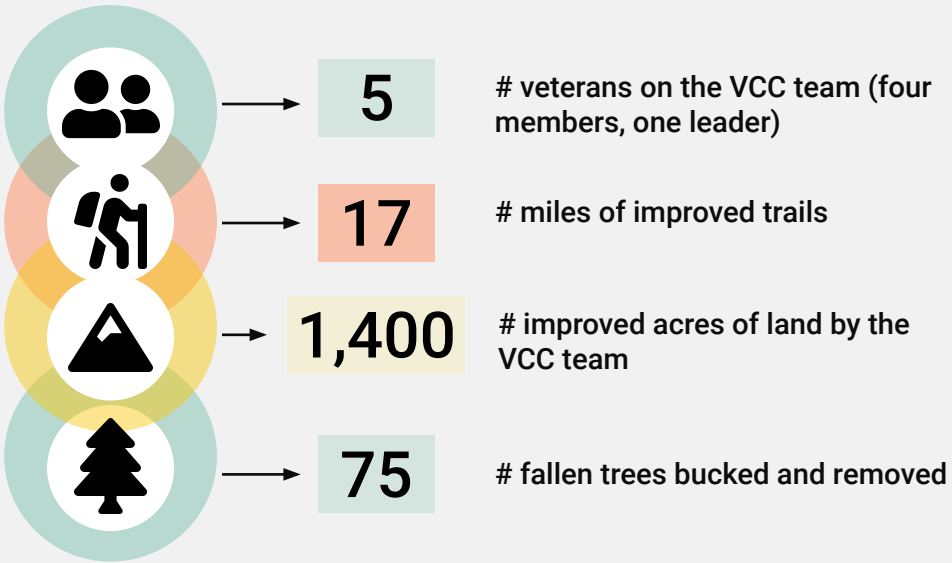
## Case Study: Advancing social and cultural, environmental, and economic goals through the Maryland Veterans Conservation Corps



### Maryland Veterans Conservation Corps (VCC)

**2020-21 Annual Report Statistics**

**Program Mission**  
The mission of the Veterans Conservation Corps (VCC) is to empower veterans and engage them in conservation service work on public lands.



5	# veterans on the VCC team (four members, one leader)
17	# miles of improved trails
1,400	# improved acres of land by the VCC team
75	# fallen trees bucked and removed

Learn more about VCC at their [website](#) and [2020-2021 Annual Report](#)





# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

## Case Study: Economic Analysis of Washington State Parks

### Washington State Park Annual Visitors

2019

36,033,338

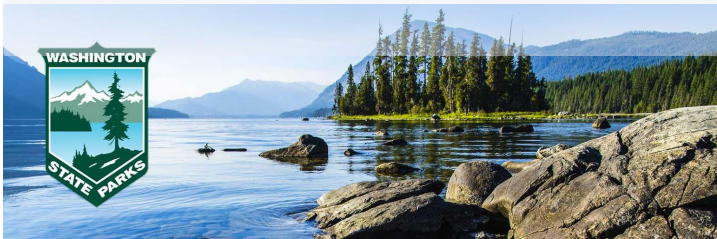
2020

37,549,238

 4.2%

2021

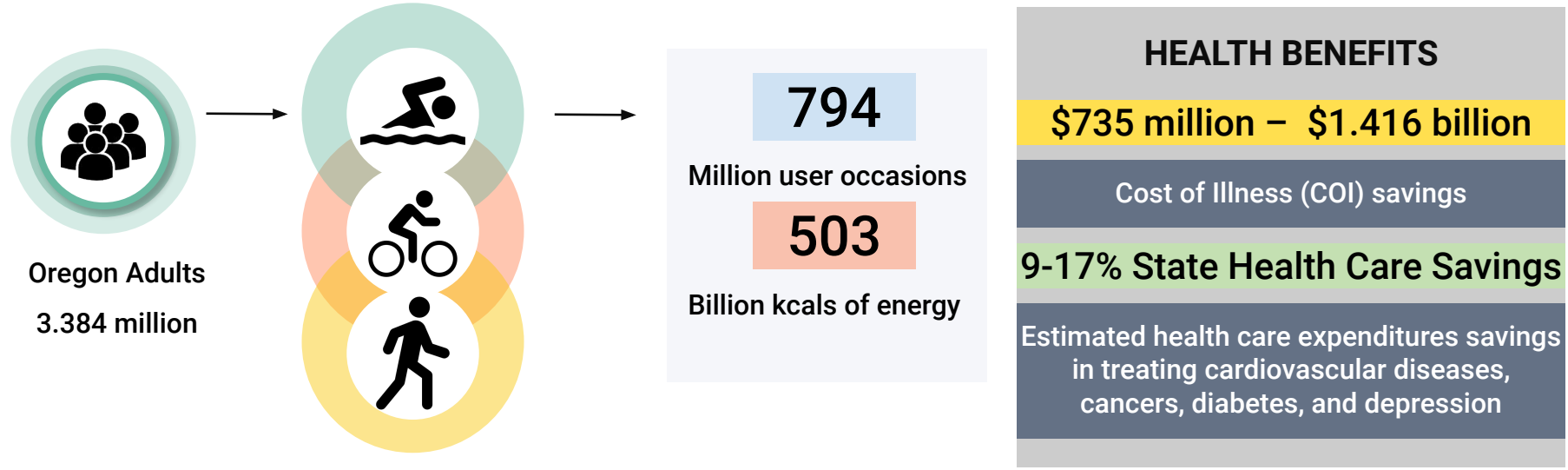
43,840,590

 16.8%


- ➔ **\$1.6B** in direct and indirect spending
- ➔ **10,000** full-time and seasonal jobs
- ➔ **\$786M** contributed to state's GDP
- ➔ **\$116M** in state and local tax revenue
- ➔ **\$5.1B** in nonmarket benefits
- ➔ **\$2.9B** in recreation benefits
- ➔ **\$1.7B** in aesthetic benefits
- ➔ **\$225M** in water quality improvements
- ➔ **\$77M** in air quality improvements

# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

## Case Study: Oregon Outdoor Recreation Metrics: Health, Physical Activity, and Value





# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

## Case Study: The Economic Value of Natural and Working Lands in North Carolina



### Agriculture

North Carolina's top industry

**\$59.0 billion** or 11% of 2017 GSP

**483,000 jobs** or 13% of workforce



### Recreational Fisheries

**\$3.2 billion** to 2018 GSP

**33,775 jobs** in 2018



### Mountain Tourism

North Carolina's top industry

**\$59.0 billion** or 11% of 2017 GSP

**483,000 jobs** or 13% of workforce



### Forestry

**\$32.8 billion** or 6% of 2017 GSP

**150,000 jobs** or 4% of workforce



### Commercial Fisheries

**\$305 million** to 2018 GSP

**7,203 jobs** in 2018



### Coastal Tourism

**\$1.1 billion** to 2016 GSP

**38,000 jobs** in 2016

# NWLs are Foundational to Social and Cultural, Environmental, and Economic Goals

## Case Study: 'Āina and Native Hawaiian Culture

Native Hawaiians have long-standing relationships with the natural world. The Hawaiian word for "land" is "'āina," which means "that which feeds"—encapsulating the "Hawaiian world view of a reciprocal and familial relationship between people and land" ([Trust for Public Land](#)). In addition to providing food and fiber, 'āina is cornerstone to the social and cultural well-being of native Hawaiians. However, as with many indigenous communities around the world, native Hawaiians have lost 'āina, including cultural sites and burial grounds, due to colonization, development, and the privatization of land.

To protect 'āina from development and return land to Hawaiian organizations, the [Trust for Public Land](#) (TPL) is working in partnership with Native Hawaiian communities. For example, the goal of the [Kāne'ōhe Pali to Lo'ī](#) project is to protect approximately 1,000 acres in Kāne'ōhe, O'ahu, an area that was once one of the most expansive agricultural areas on O'ahu and will protect historically and culturally unique native forest. TPL is collaborating with the Kāne'ōhe community, local farming nonprofits, and the State on the project. Once the land is acquired, the area will be transferred to the State of Hawai'i Division of Forestry and Wildlife and local nonprofits. These entities will be responsible for stewarding the land in perpetuity.



Sources: 1) Zak Noyle and 2) The Trust for Public Land



**Key Point:** The cultural and social value of NWLs is diverse and immense. Although these benefits are difficult to quantify, the cultural and social value and benefits of NWLs are often the services that are the most important to people's identity, sense of place, belonging, and culture ([Tracking the Benefits of Natural and Working Lands in the United States: Dataset Evaluation and Readiness Assessment](#)).



## Part 3: The Role of NWLs in Climate Action

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### Key Takeaways

- NWLs refer to the variety of land types that make up the natural environment: forests and woodlands, grasslands and shrublands, croplands and rangelands, wetlands, and urban green spaces.
- NWLs are managed for diverse objectives: the production of food and forest products, carbon sequestration and storage, tourism, open space, recreation, and private use. These management objectives influence how much NWLs emit, sequester, and store carbon.
- NWLs are critical to achieving the goals of the Paris Agreement to limit global warming to 1.5 degrees Celsius.
- NWLs provide innumerable social and cultural, environmental, and economic benefits.

# 4. Foundational Principles and Strategies to Enhance the Contribution of Natural and Working Lands to Climate Goals

[Section Objective and Overview](#)

[Part 4.1: Foundational Principles](#)

[Part 4.2: Strategies](#)

# Part 4: Foundational Principles and Strategies

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## Section Objective and Overview

### Section Objectives:

- Communicate key steps to fortifying the role of natural and working lands (NWLs) in reducing GHG emissions and increasing carbon sequestration and storage
- Present "process" case studies that illustrate how various states have integrated NWLs into state climate action

### Part 4, Section 1—Foundational Principles—Overview:

- This section presents Foundational Principles to guide effective, sustainable, and equitable efforts to enhance the contribution of NWLs to state climate goals. These Principles are enumerated in the context of NWLs but can be used when developing goals/targets across sectors.

### Part 4, Section 2—Strategies—Overview:

- This section presents Strategies to guide the process of scoping, establishing, and implementing NWL goals and targets.

### Notes:

- "Process" case studies—examples of how Alliance states have approached the steps described in each section—and links to additional resources are included in Part 4, Section 1 and Part 4, Section 2.
- Although the Foundational Principles and Strategies are presented in numerical order, in practice, states should be prepared to move fluidly among Foundational Principles and Strategies, as well as advance all processes concurrently.

# 4.1 Foundational Principles to Enhance the Contribution of Natural and Working Lands to Climate Goals

## Section Objective and Overview

### Foundational Principle 1: Conduct Early and Ongoing Stakeholder Engagement

### Foundational Principle 2: Embed Equity and Justice in Every Action

### Foundational Principle 3: Review the Landscape of Research and Data

### Foundational Principle 4: Track, Evaluate, and Share Progress

## Key Takeaways



## Part 4, Section 1: Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

### Section Objective and Overview

#### Section Objective:

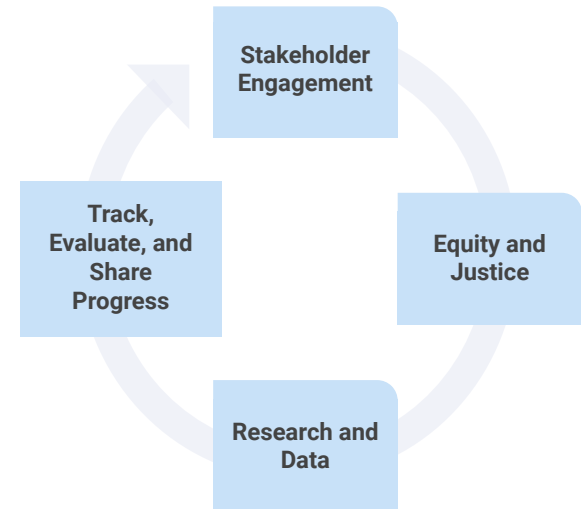
- Present Foundational Principles to guide effective, sustainable, and equitable efforts to enhance the contribution of NWLs to state climate goals/targets

#### Part 4, Section 1—Foundational Principles—Overview:

- To scope, establish, and implement effective NWL goals/targets, states must advance the following Foundational Principles:
  - Conduct inclusive and ongoing stakeholder engagement
  - Embed and center equity and justice in every action
  - Review the landscape of research and data that can inform and support the development of your goal/target
  - Track, evaluate, and share progress

#### Notes:

- Although the Foundational Principles are presented in a numerical order, in practice, states should be prepared to move fluidly among Principles, as well as advance all Principles concurrently.
- These Foundational Principles can be applied to any sector when evaluating how to enhance the sector's contribution to state climate action.





# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 1. Conduct Early and Ongoing Stakeholder Engagement

Conduct **early and ongoing stakeholder engagement** to generate data, ideas, and build broad buy-in for climate action

- Regularly engage stakeholders, including those representing vulnerable and underserved populations and members of those populations, to gauge needs, values, and opportunities to be addressed through effective goal/target setting and implementation. Both at the beginning of and throughout the stakeholder engagement process, states and local governments should intentionally seek out voices that represent vulnerable and underserved populations to understand their concerns and needs and engage in a cooperative dialogue. In addition, governments should facilitate identifying and procuring resources that help individuals within these communities overcome barriers to participation in the public process.
- To ensure that state-level planning efforts and goals are effective, states should work with sub-state stakeholders to ensure alignment of regional and local priorities and action. This sub-state alignment is particularly important for ensuring that state climate plans create social equity, in view of different government service histories and needs between urban and rural communities and socioeconomic groups.



**Key Point:** Engaging stakeholders builds deeper in-state organizational capacity and a growing community of practice around climate action that helps strengthen public support for ambitious climate strategies.

"Robust stakeholder processes can play a critical role in surfacing and managing trade-offs, promoting societal buy-in, and helping to ensure a just transition" ([Levin et al., 2020](#)).



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 1. Conduct Early and Ongoing Stakeholder Engagement

### Case Study: North Carolina

#### Developing Shared Goals Among Stakeholders

Stakeholders in North Carolina developed shared goals for the state's [NWL Action Plan](#). These objectives helped guide the recommendations that were developed to support ambitious NWL climate action in the state (see Figure 5).

No.	Shared Core Goal
1.	Enhance the ability of NWL to sequester carbon and mitigate GHG emissions.
2.	Build resilience in ecosystems and communities.
3.	Provide public health and ecosystem co-benefits.
4.	Create economic opportunities for agribusiness, recreation, and tourism.
5.	Ensure implementation of any action is a socially equitable process.

Figure 5: Shared goals for North Carolina's NWL Action Plan  
Source: [North Carolina Natural and Working Lands Action Plan](#)

### Case Study: California

#### Engaging Diverse Stakeholders to Develop and Implement a Just and Equitable NWL Climate Action Strategy

In 2022, the California Natural Resources Agency released its [NWL Climate Smart Strategy](#). CNRA led an extensive public engagement process throughout 2021 in the form of regional workshops, questionnaires, advisory panels, government-to-government tribal consultations, tribal listening sessions, and a public comment period to solicit and incorporate input from all NWL stakeholders. The NWL Climate Smart Strategy defines California's natural and working landscapes, describes how improved management of these landscapes can deliver on our climate change goals and advance broader objectives, highlights priority nature-based climate solutions, outlines regional opportunities, identifies options to track climate action and measure progress, and provides recommendations to scale nature-based climate solutions across California.



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

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## 1. Conduct Early and Ongoing Stakeholder Engagement



Establish a **governance structure** to facilitate communication and collaboration across stakeholders, including the public, non-governmental organizations (NGOs), academic institutions, land managers, community-based organizations, tribes, and more.



### **Case Study: Maryland Commission on Climate Change**

The Maryland [Commission on Climate Change](#) is an example of a governance structure that was established to conduct stakeholder engagement and liaison with government agencies and legislatures.



### **Case Study: Maine Task Force on the Creation of a Forest Carbon Program**

The Maine Governor's [Task Force on the Creation of a Forest Carbon Program](#) released a [report](#) with its final recommendations for maximizing carbon storage on Maine's smaller woodlands. Recommended by Maine Won't Wait, the state climate action plan, and established by Executive Order on January 13, 2021, the Task Force was charged with developing incentives to encourage forestland management practices that increase carbon storage specifically on woodlands of 10 to 10,000 acres while maintaining harvest levels overall. The 10-month long process involved substantial public input and resulted in a consensus report containing wide-ranging recommendations which, if implemented, will enable Maine's forests to contribute significantly toward achieving the state's climate goals.



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 2. Embed Equity and Justice in Every Action



Climate change impacts everyone, yet disproportionately affects low income and disadvantaged communities, often communities of color. These communities are both exposed to higher levels of climate pollution and more vulnerable to climate impacts. In addition, under-resourced communities are often left behind in the development and implementation of new climate technologies and solutions due to a variety of challenges including lack of resources and access to capital.

States and local governments must ensure that vulnerable and underserved communities can play an active role in shaping climate goals/targets and the processes to realize these goals (see next [slide](#) for additional information).

**Identify disproportionately impacted and vulnerable populations**

**Prioritize funding for vulnerable and underserved populations**

**Provide technical assistance and capacity building for vulnerable and underserved populations**

**Center equity in leadership, processes, and investment strategies**



**Key Point:** NWL climate action has broad implications for public health, emissions, jobs, mobility options, and natural resource health. As such, equity and justice must be embedded into all aspects of goal/target setting.



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 2. Embed Equity and Justice in Every Action

### Identify disproportionately impacted and vulnerable populations

Understanding communities and populations likely to experience greater harms from climate change or who might have less access to resources necessary to design and implement climate programs requires that governments take proactive steps to identify these locations and/or populations. Communities that are likely to experience disproportionate effects include tribes, rural communities, communities that have experienced disinvestment or redlining, and communities with high pollution burdens.

### Prioritize funding for vulnerable and underserved populations

Dedicate funding to communities disproportionately impacted by climate burdens. Vulnerable and populations and communities require funding simply to reach equitable health and access conditions. By allocating specific funding to vulnerable and underserved populations (including households, neighborhoods, and full census tracts), states create opportunities for just outcomes for all.

### Provide technical assistance and capacity building for vulnerable and underserved populations

Currently, technical assistance programs, those programs that fund formation, facilitation, and support for collaborative decision-making bodies, are scattered through government and philanthropic organizations. Systematizing access to funding for vulnerable and underserved populations can improve community cohesion, enhance knowledge about climate change and resilience, and increase priority community competitiveness for special funds.

### Center equity in leadership, processes, and investment strategies

To signal that distribution matters and that leaders are accountable to people, particularly those disproportionately at risk yet have the fewest resources to adapt, center equity in leadership, processes, and investment strategies. To improve equity, state government at all levels and across all processes must be diverse and inclusive.

Note: These recommendations are not comprehensive or all-encompassing and are adapted from USCA resources such as the [USCA Resilience Playbook](#) and the [Just and Equitable Transition State Policy Framework](#).

# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 2. Embed Equity and Justice in Every Action

### Case Study: Maryland

#### Embedding Environmental Justice in Tree Maintenance and Planting Goals

In 2021, Maryland passed the [Tree Solutions Now Act](#) and established the goal of planting and helping to maintain five million additional native trees by 2031. At least ten percent of the trees planted through this [plan](#) must be planted in underserved urban areas.

In 2022, Maryland passed the [Climate Solutions Now Act](#), which directs the Maryland Department of the Environment (MDE), with support from the state's Commission on Environmental Justice and Sustainable Communities, to:

- Develop a methodology for identifying communities disproportionately affected by climate impacts,
- Identify specific strategies to address geographical impact concerns, reduction emission of greenhouse gases and co-pollutants, and build climate equity and resilience within communities disproportionately affected by climate, and
- Set appropriate goals for the percentage of State funding for GHG emission reduction measures that should be used for the benefit of disproportionately affected communities.



### Case Study: California

#### Defining Vulnerable Communities

##### STATE VULNERABLE COMMUNITIES DEFINITION

**Climate vulnerability** describes the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerable communities experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. These disproportionate effects are caused by physical (built and environmental), social, political, and/or economic factor(s), which are exacerbated by climate impacts. These factors include, but are not limited to, race, class, sexual orientation and identification, national origin, and income inequality.

Source: [California Integrated Climate Adaptation and Resiliency Program](#)



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 2. Embed Equity and Justice in Every Action



### Case Study: California, Colorado, Michigan, New Mexico, Washington, and Wisconsin

#### Equity-Based State Decisions to Support Outdoor Access

- Officials estimate that about three in four visitors to America’s state and national parks are White, well above the population rate of 60 percent
- Studies suggest millions of Black and Hispanic Americans miss out on the health benefits of being in nature—stress reduction and physical exercise among them—because they lack access to parks
- California estimates six in ten residents live in “park-poor neighborhoods,” with less than three acres of park and open space per thousand residents

#### California

In December, 2021 announced grants of \$548M to revitalize roughly 100 community parks and build a new state park in the San Joaquin Valley

#### Colorado

Public libraries offer free backpacks containing park passes, maps, wildlife brochure, and binoculars.

#### Michigan

In March 2022, announced a new \$30M state park to be built on the site of a former Chevrolet plant a mile from downtown Flint

#### New Mexico

Created an Outdoor Equity Fund in 2019 to transform the state by championing sustainable outdoor recreation, especially those who have historically been excluded

#### Washington

Appropriated \$85K for a work group to develop recommendations on how to increase participation of Black residents in state parks and other public recreation areas

#### Wisconsin

In 2014, began implementing a 10-year, \$25M plan to remake Milwaukee’s 52 playgrounds throughout the city



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 3. Review the Landscape of Research and Data

Identify resources that can inform and support the development of a goal/target (see examples of state and federal resources in Figure 6).

Communicate among entities—including state and federal agencies, think tanks, NGOs, consultants/contractors, academic institutions, and more—to identify resources that can support the development of a goal/target *and* to break down silos and work with partners across sectors and departments.

For example, states can convene air resources boards or managers, the NWL coordinator or interagency team, other natural resource program managers and policy advisors, GHG inventory and analysis leads, and more, to aggregate and assess existing resources, as well as gaps that will inform the state's strategy to most effectively integrate NWL into climate action.

### State Resources

- Land Management Plan
- Habitat Conservation Plan
- Forest Action Plan
- Climate Action Plan
- Climate Adaptation or Resilience Plan
- Coastal Management Plan
- Wildlife Action Plan
- Water Plan
- Agriculture Plan
- NWL Proposal/Plan (if applicable)
- State Decarbonization Plan (if applicable)
- NWL GHG Inventory (if applicable)
- Land-Grant Universities

### Federal Resources

- National and State GHG Inventory
- National Labs

Figure 6: Examples of state and federal resources to support the development of a NWL goal/target



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 3. Review the Landscape of Research and Data



Examples of additional resources, including tools, that can inform and support the development and implementation of a NWL goal/target include the following (a complete list of resources referenced in this Guide is on slides [166-167](#)).

GHG Inventories and Analysis	Planning and Policy	Applied Research
<ul style="list-style-type: none"> <li>• <a href="#">Context and Future Directions for Integrating Forest Carbon into Sub-National Climate Mitigation Planning in the RGGI Region of the US</a>—Lamb et al., 2021</li> <li>• <a href="#">Natural and Working Lands Inventory Improvements: A Guide for States</a>—World Resources Institute (WRI)</li> <li>• <a href="#">State Inventory and Projection Tool</a>—US Environmental Protection Agency (EPA)</li> <li>• <a href="#">The Carbon Reduction Potential Evaluation Tool (CaRPE)</a>—American Farmland Trust</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Decision-Makers Guide to Natural Climate Solutions</a>—US Nature4Climate (includes many resources related to NWLs and NCS)</li> <li>• <a href="#">Developing a State-Level Natural and Working Lands Climate Action Plan</a>—Nicholas Institute for Energy, Environment, and Sustainability</li> <li>• <a href="#">Forest-Climate Working Group</a></li> <li>• <a href="#">Just and Equitable Transition State Policy Framework</a>—US Climate Alliance (USCA) and BlueGreen Alliance</li> <li>• <a href="#">Power of Place: Land Conservation and Clean Energy Pathways for California</a>—The Nature Conservancy (TNC)</li> <li>• <a href="#">US Climate Alliance Annual Report, 2022</a>—US Climate Alliance (USCA)</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Natural Climate Solutions for the United States</a>—Fargione et al., 2018</li> <li>• <a href="#">Protect, Manage, and then Restore Lands for Climate Mitigation</a>—Cook-Patton et al., 2021</li> <li>• <a href="#">State Climate Policy and Nature-based Solutions: A Match that Provides Multiple Benefits for Climate, Water, and More</a>—Marcus 2022</li> <li>• <a href="#">Testing Ecosystem Accounting in the United States: A Case Study for the Southeast</a>—Warnell et al., 2020</li> </ul>



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 3. Review the Landscape of Research and Data

### Case Studies: California, Maine, North Carolina, and Oregon

#### Integrating Blue Carbon into State GHG Inventories through Collaborative Research Initiatives

"Blue carbon" refers to coastal wetland ecosystems that are natural carbon sinks, including kelp forests, marshes, seagrass beds, and forested swamps. These ecosystems also provide critical social, economic, and environmental benefits.

IPCC methodologies exist for coastal wetlands, but are currently lacking for other blue carbon ecosystems, such as kelp. This lack of established methodologies for some blue carbon ecosystems limits if and how these ecosystems are integrated into GHG inventories, as well as state programs and policies.

Alliance states are working with a network of external partners to better understand and integrate blue carbon into state climate action:

- **California's** Ocean Protection Council and San Francisco Estuary Institute (SFEI) are working together to develop a coastal wetlands, beaches, and watersheds inventory ([Scoping Plan-NWL Appendix Page 2](#)). A recent [report](#) by SFEI details how California can incorporate blue carbon into its GHG inventory.



Sources: 1) Matt Wade, Bigelow Laboratory for Ocean Sciences, Boothbay, Maine  
2) [Benjamin L. Jones](#)

# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 3. Review the Landscape of Research and Data

### Case Studies: California, Maine, North Carolina, and Oregon (continued)

#### Integrating Blue Carbon into State GHG Inventories through Collaborative Research Initiatives

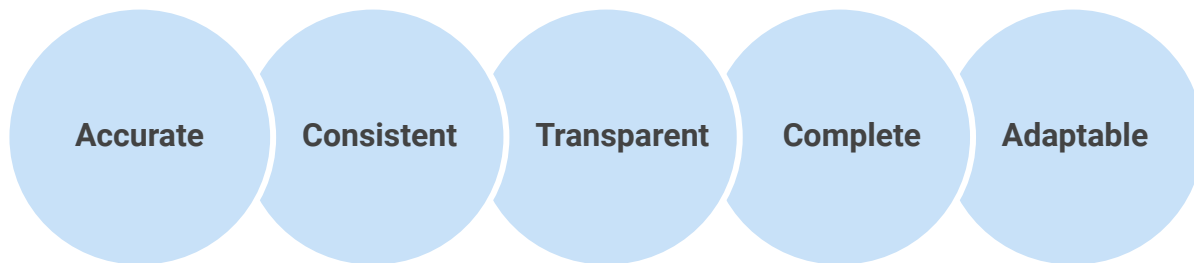
- **Maine's [Blue Carbon Network](#)** was formed in 2020 as a hub for blue carbon research and stakeholder engagement, including on developing and refining GHG inventories for the state's blue carbon resources (salt marshes, seagrasses, and seaweeds).
- **North Carolina** became the first state to incorporate seagrass into the state's blue carbon inventory. Drawing on guidance from the [2013 IPCC Wetlands Supplement](#) to ensure consistency with national GHG reporting, the Coastal Habitats Greenhouse Gas Working Group pursued the following steps to develop the state's first GHG inventory for seagrass: 1) estimated the total extent of seagrass habitats by year, 2) identified appropriate emissions and removals factors, 3) calculated emissions and removals, and 4) applied uncertainty estimates ([PEW](#)).
- **Oregon** established the Blue Carbon Technical Team in response to Governor Brown's 2020 Executive Order, which directed the Oregon Global Warming Commission to establish state goals for carbon sequestration on NWLs. The Blue Carbon Technical team includes carbon scientists, GGI specialists, and state coastal management program staff. The Team developed the state's blue carbon GHG inventory and policy recommendations for Oregon's blue carbon ecosystems. Additional information can be found in "[Incorporating Coastal Blue Carbon Data and Approaches in Oregon's First Generation Natural and Working Lands Proposal.](#)"

# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

A GHG emissions reduction goal/target and/or state climate action plan establishes a state's climate ambition. To best help state decision-makers and policy leads, as well as outside stakeholders and the public assess, understand, and report on climate goals, tools that can **track, evaluate, and share progress** towards climate goals are critical. Examples of these tools include state-wide GHG emissions inventory reports, dashboards, and scenario analysis (see slide [56](#)).

### Qualities of Effective Tools to Track, Evaluate and Share Progress:



Source: Adapted from [Mitigation Goal Standard](#)



**Key Point:** Accurate, consistent, transparent, and complete tools can facilitate widespread engagement and participation in setting and implementing climate goals/targets, thus fostering more effective and inclusive support for climate action ([Mitigation Goal Standard](#) and [Levin et al., 2020](#)). Tools to track, evaluate, and share progress should also be adaptable and have the ability to be updated based on the best available science and aligned with the appropriate base year.



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

### The Role(s) of GHG Inventories

One of the primary ways that states track, evaluate, and share progress on climate action is through a **GHG Inventory**. For the NWL sector, NWL GHG inventories, often categorized as land use, land use change and forestry (LULUCF) inventories, estimate carbon stocks and fluxes across different land use categories and quantify the uncertainty around these estimates. Some states have developed and released NWL-specific inventories that are separate from their state-wide GHG inventory report, while other states have integrated NWLs into their full GHG inventory report (see slides [65-85](#) for examples of how various Alliance states track, evaluate, and share progress on NWL climate action through a GHG inventory).

Measure progress toward economy-wide or sectoral GHG reduction goals

Inform policy making and adaptive program management

Track performance of existing programs and projects

Fulfill regulatory or legislative reporting requirements

Demonstrate importance of land carbon sink



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

### Key Points:

- GHG inventories are not necessarily released every year and, when released, are reporting on data from at least two years prior.
- NWLs are a natural system and the uncertainty of estimating GHG flux for many NWL categories—including forests, cropland and grassland soils, and land use change—is disproportionately large compared to other sectors in the National GHG Inventory ([WRI, 2020](#)). This uncertainty can be magnified in state inventories due to smaller pools of sample data and less state-specific calibration of models ([WRI, 2020](#)).
- Given the critical role that state inventories play as a mechanism to assess and communicate the state's carbon sequestration and mitigation, states, with support from the federal government, NGOs, and universities, should continuously be working to improve their NWL inventories. Additional information on how states can improve their NWL inventories can be found in [Natural and Working Lands Inventory Improvements: A Guide for States](#).





# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

### Tools to Track, Evaluate and Share Progress

State	Tool	Description of Tool
Colorado	<a href="#">Greenhouse Gas Metrics</a>	Platform to track progress between inventory updates
Hawai'i	<a href="#">Aloha+ Challenge Progress Challenge (Natural Resource Management)</a>	Tracks progress towards natural resource management goals; specifies if a goal is on track, near target, needs improvement, or is being measured
Maryland	<a href="#">Greenhouse Gas Reduction Act (GGRA) Progress Report</a>	Report describing the state's progress toward achieving its GHG reduction goals and the GHG reductions needed by 2050 in order to avoid changes to the Earth's climate system, based on the predominant view of the scientific community at the time of the latest report.
Massachusetts	<a href="#">Global Warming Solutions Act (GWSA) Implementation Progress</a>	Communicates state progress towards the goals of the GWSA, including a <a href="#">10-year progress report</a> and progress towards GHG goals; points to resources on short- and long-term planning efforts
Minnesota	<a href="#">Enterprise Sustainability*</a>	State climate dashboard; includes discussion on existing barriers to achieving state goals and agency-specific scorecards
New York	<a href="#">State Climate Progress Tracker</a>	Tracks progress being made towards the implementation of the Climate Leadership and Community Protect Act (Climate Act)
Wisconsin	<a href="#">Trillion Trees Pledge</a>	Tree planting tracker on the state's Department of Natural Resources website to track progress to plant 7 million trees by 2030

\* Not an NWL tool





# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

NWLs are foundational to social and cultural, environmental, and economic well-being. In addition to tracking GHG emissions and carbon sequestration and storage, states can use a variety of metrics to track, evaluate, and share the benefits of NWLs.

NWL Benefit	Metric(s) that can be used to Track, Evaluate and Share NWL Benefits
<b>Air quality and human health</b>	Avoided health impacts due to pollutant removal by trees, value of avoided health impacts due to pollutant removal by trees
<b>Biodiversity</b>	Imperiled species richness (total and rarity-weighted)
	NWL with rare species and habitats
	NWL with high resilience to sustain biodiversity with climate change and serving as corridors for species movements in response to climate change
<b>Energy conservation</b>	Avoided spending on cooling costs due to temperature reduction by urban trees
<b>Energy production</b>	Solar, wind, hydropower, and geothermal energy generation capacity
<b>Fire risk reduction</b>	NWL treated for fire risk reduction on US Forest Service lands
<b>Flood risk reduction</b>	NWL areas that are likely to reduce runoff in high flood risk watersheds, annual runoff reduction due to trees in high flood risk watersheds, population at risk of flooding in high flood risk watersheds

Note: The social and cultural benefits provided by NWLs are not included in this chart (continued on next [slide](#)) given that both benefits are very difficult to measure (see [Tracking the Benefits of Natural and Working Lands in the United States: Dataset Evaluation and Readiness Assessment](#) for additional information).

Source: Adapted from [Tracking the Benefits of Natural and Working Lands in the United States: Dataset Evaluation and Readiness Assessment](#)



# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## 4. Track, Evaluate, and Share Progress

NWL Benefit	Metric(s) that can be used to Track, Evaluate and Share NWL Benefits
<b>Food</b>	Value of crops created by wild pollinators
<b>Forest products</b>	Timber harvested from all forests (public and private)
<b>Jobs</b>	Employment in forestry, agriculture, and commercial fishing by NAICS code
<b>Recreation</b>	Visitors to federal public lands for a wide range of recreational activities (e.g., hiking, boating, hunting, bicycling, various types of camping)
	Publicly accessible open space (public and private) in Census-defined urban areas
<b>Water quality</b>	Important watersheds for production of clean drinking water, based on land cover and water yield, potential threats to surface drinking water from insects and disease, wildfire, climate change, and land-use change



**Key Point:** GHG inventories are not the only tool that states can use to track, evaluate, and communicate NWL climate action. There are many other ways that states can report on progress to help their constituents, partners, and the public understand where the state is headed. Such tools often track metrics that are available more frequently than a GHG inventory, including acres restored, trees planted, and funds invested.

# Foundational Principles to Enhance the Contribution of NWLs to State Climate Goals

## Part 4, Section 1 – Key Takeaways

Engaging stakeholders builds deeper in-state organizational capacity and a growing community of practice around climate action that helps strengthen public support for ambitious climate strategies.

Strong partnerships and relationships are critical to setting and achieving effective and ambitious climate goals.

NWL climate action has broad implications for public health, emissions, jobs, mobility options, and natural resource health. As such, equity and justice must be embedded into all aspects of goal/target setting.

The data and resources that a state has access to will inform how the state scopes, determines, and implements a NWL goal/target.

Accurate, consistent, transparent, and complete tools can facilitate widespread engagement and participation in setting and implementing climate goals/targets, thus fostering more effective and inclusive support for climate action.

NWLs are a natural system and the uncertainty of estimating GHG flux for many NWL categories—including forests, cropland and grassland soils, and land use change—is disproportionately large compared to other sectors.



# 4.2 Strategies to Enhance the Contribution of Natural and Working Lands to Climate Goals

## Section Objective and Overview

### Strategy 1: Establish the Scope of a NWL Goal/Target

### Strategy 2: Examine NWL Sources and Sinks

### Strategy 3: Assess the Role that NWLs could Play in a State's Climate Strategy

### Strategy 4: Set a NWL Goal/Target

### Strategy 5: Assess Tradeoffs and Opportunities for NWL Climate Action

### Strategy 6: Implement NWL Climate Action Strategies

## Key Takeaways

## Part 4, Section 2: Strategies to Enhance the Contribution of NWLs to Climate Action


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### Section Objective and Overview


#### Section Objective:

-  Present Strategies to guide the process of scoping, establishing, and implementing NWL goals and targets

#### Part 4, Section 2—Strategies—Overview:

-  To scope, establish, and implement effective NWL goals/targets, states should consider advancing the following Strategies:
  1. Establish the scope of a NWL goal/target
  2. Examine NWL sources and sinks
  3. Assess the role that NWLs could play in a state's climate strategy
  4. Set a NWL goal/target
  5. Assess tradeoffs and opportunities of NWL climate action strategies
  6. Implement NWL climate action strategies


#### Note:

-  Although the Strategies are presented in a numerical order, in practice, states should be prepared to move fluidly among Strategies, as well as advance all Strategies concurrently.

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 1. Establish the Scope of a NWL Goal/Target

 **Strategy Objective:** Establish a comprehensive definition of the NWL sector and review existing authority and parameters to identify what will and will not be included in a NWL goal/target; establish the foundation for aligning a) state climate plans, b) GHG inventories, and c) inclusion of NWLs in state-wide GHG reduction goals/targets

### Step 1: Review Existing Authorities and Parameters

1. Understand existing state climate goals/targets, including economy-wide and NWL sector-specific GHG emissions reductions, net-zero, or net-negative targets
2. Determine how existing targets were established (e.g., identify existing legislation that establishes or informs the scope of a NWL goal/target such as an economy-wide goal/target or existing definition of NWL)
  - For example, **Massachusetts'** definition for NWL is defined in the state's [2021 Climate Law](#) as “lands within the Commonwealth that: (i) are actively used by an agricultural owner or operator for an agricultural operation that includes, but is not limited to, active engagement in farming or ranching; (ii) produce forest products; (iii) consist of forests, grasslands, freshwater and riparian systems, wetlands, coastal and estuarine areas, watersheds, wildlands or wildlife habitats; or (iv) are used for recreational purposes, including parks, urban and community forests, trails or other similar open space land.”

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 1. Establish the Scope of a NWL Goal/Target

### Step 1: Review Existing Authorities and Parameters (continued)

3. Assess if and how NWLs are included in existing economy-wide and sector-specific (NWL) targets
  - For example, **Maryland** has a near-term GHG reduction goal (originally 40 percent by 2030 from 2006 levels and now 60 percent by 2031) that does not include NWL. The state's 2045 net-zero goal, however, does include NWLs. Building on the inclusion of NWLs in Greenhouse Gas Reduction Act (GGRA) Plan, the state is working to establish processes to be able to track, evaluate, and communicate the emissions reductions and carbon sequestration of the sector. The full inclusion of NWLs in the state's inventory is anticipated for the state's 2023 inventory.
4. Identify which state entities (department/agency/taskforce) are responsible for the following:
  - Managing NWLs
  - Overseeing the development and implementation of NWL goals/targets
  - Tracking, evaluating, and sharing progress made towards NWL goals/targets
5. Consider a) state influence, b) federal influence, and c) the relationship between the two

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 1. Establish the Scope of a NWL Goal/Target

### Step 2: Examine Additional Considerations

1. Align a) state climate plans, b) GHG inventories, and c) inclusion of NWLs in state-wide GHG reduction goals/targets to ensure that all climate action policies and programs are integrated in support of shared goals
  - For example, **Maryland** is partnering with the [NASA Carbon Monitoring System](#) and the University of Maryland to integrate the same science that is being used for the state's GHG inventory to 1) identify the carbon sequestration potential (CSP) of new plantable areas and 2) to track urban/small scale tree planting efforts through the state's tree tracking tool as part of its [goal to plant and maintain 5 million native trees](#). To further align data across various climate action plans and policies, Maryland is currently working to better integrate the impacts of improved forest management practices to the state's annual forest carbon flux data.
2. Determine how NWL emissions from combustion of NWL-derived products will be counted
  - For example, **Massachusetts** [Senate Bill 9 - An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy](#) requires tracking NWL: "including...the release of measurable greenhouse gases from and carbon sequestration by natural and working lands and the products derived from these lands to the maximum extent practicable..."
3. Identify the state's position on alternative compliance mechanisms such as carbon offsets and consider how this position informs GHG reduction goals/targets for the NWL sector, as well as economy-wide goals/targets
4. Consider how abatement costs will inform the NWL implementation strategies the state pursues



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

**Strategy Objective:** Assess the sources and sinks of the NWLs and the sector's contribution to the state's gross emissions by developing a NWL GHG Inventory

- NWL GHG inventories, often categorized as land use, land use change and forestry (LULUCF) inventories, estimate carbon stocks and fluxes across different land use categories, and quantify the uncertainty around these estimates
- NWL GHG inventories can help states establish NWL goals/targets, measure progress towards net GHG goals, set policies, manage land, and communicate with stakeholders

### An Effective NWL GHG Inventory should:

Establish a robust and detailed historical baseline for net and gross emissions that can be used to track progress towards a goal/target and identify opportunities for policy interventions

Have the capacity to track the impact of management interventions and disturbances (overlay activity data, be spatially explicit) and inform projections of future trends

Be able to quantify year-to-year changes in greenhouse gas sources and sinks as well as multi-year averages

\* For detailed information about NWL GHG inventories, see [Natural and Working Lands Inventory Improvements: A Guide for States](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Step 1: Develop a Basic NWL Inventory to Examine NWL Sources and Sinks Using the US Environmental Protection Agency's State Inventory Tool (SIT) and/or other Federal Data Sources

- All states can use [SIT](#) to generate a basic NWL inventory
- SIT is a free, interactive spreadsheet model with sector-specific modules—including a Land Use, Land Use Change and Forestry (LULUCF) module—updated annually by the United States Environmental Protection Agency (EPA) to help states develop or update a GHG inventory
- The methods used and sectors included in SIT are the same as those in the national [US GHG Inventory](#)
- Users can either use default, pre-loaded data or apply state-specific data
- SIT aggregates data from many sources, including:
  - National GHG Inventory
  - US Forest Service Forest Inventory and Analysis (FIA) Data (see Figure 7)
- SIT can be used to track progress toward a GHG goal/target and/or inform NWL policymaking; the tool can also be used to produce a simple forecast of emissions through 2050

### Note: Limitations of SIT include:

- Default data are not timely, and many NWL data inputs are not refreshed year-to-year
- Some NWL data sources and estimation methods are less sophisticated than those used in the National GHG Inventory
- Does not report estimates according to IPCC land use categories, making comparisons with the National GHG difficult
- Excludes wetlands (both tidal and terrestrial)—see case study X for an example of how states are addressing this gap
- Does not quantify uncertainty around GHG flux estimates
- Limited default data available for Alaska and Hawai'i
- Perpetuates limitations of the National GHG Inventory (e.g., estimates are not temporally or spatially explicit)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Using Existing Resources to Examine NWL Sources and Sinks—US Forest Service

Even if a state is not planning on developing an official NWL GHG inventory, there are many existing and accessible state and federal datasets that can help inform the landscape of NWL sources and sinks in a state. For example, US Forest Service Forest Inventory and Analysis (FIA) is a national dataset that states can use—either through SIT or independently—to see estimates of national or state emissions and removals from the LULUCF sector.

#### 2020 national emissions and removals (net flux) from land use, land-use change, and forestry (LULUCF) (MMT CO<sub>2</sub>e)

Emissions and Removals Category <sup>a</sup>	1990	1995	2000	2005	2010	2016	2017	2018
Forest land remaining forest land <sup>b</sup>	(610.1)	(598.7)	(572.1)	(572.6)	(556.2)	(565.5)	(552.0)	(564.5)
Non-CO <sub>2</sub> emissions from fire	1.5	0.6	2.9	8.2	4.6	5.6	18.8	18.8
N <sub>2</sub> O emissions from forest soils	0.1	0.3	0.5	0.5	0.5	0.5	0.5	0.5
Non-CO <sub>2</sub> emissions from drained organic soils	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Forest land converted to non-forest land <sup>b</sup>	119.1	120.8	122.5	124.4	126.0	127.4	127.4	127.4
Non-forest land converted to forest land <sup>b</sup>	(109.4)	(109.7)	(109.9)	(110.2)	(110.4)	(110.6)	(110.6)	(110.6)
Harvested wood products	(123.8)	(112.2)	(93.4)	(106.0)	(69.1)	(92.4)	(95.7)	(98.8)
Woodlands remaining woodlands <sup>c</sup>	5.0	4.9	4.8	4.6	4.4	4.1	4.0	4.0
Urban trees in settlements <sup>d</sup>	(96.4)	(103.3)	(110.4)	(117.4)	(124.6)	(129.8)	(129.8)	(129.8)
<b>Total Emissions and Removals</b>	<b>(813.9)</b>	<b>(797.2)</b>	<b>(755.0)</b>	<b>(768.4)</b>	<b>(724.7)</b>	<b>(760.6)</b>	<b>(737.3)</b>	<b>(752.9)</b>

Figure 7: 2020 FIA LULUCF data  
Source: [US Forest Service 2020](#)



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 2. Examine NWL Sources and Sinks

### Case Study: Vermont

#### NWL GHG Inventory and Net-Zero

The passage of the [Global Warming Solutions Act](#) (GWSA) by the Vermont legislature in 2020 required the creation of the first Vermont Climate Action Plan (CAP) to include specific initiatives, programs, and strategies to achieve the State's GHG emissions reduction requirements. The plan was also to contain specific initiatives, programs, and strategies to “achieve long-term sequestration and storage of carbon and promote best management practices to achieve climate mitigation, adaptation, and resilience on natural working lands” as well as to “achieve net zero emissions by 2050 across all sectors.” The GWSA contains no specific discussion or guidance related to the inventorying of NWL or estimating carbon fluxes and relies upon existing statutes to provide high-level guidance on inventory practices.

Currently the Vermont GHG emissions inventory includes only a subset of the NWL categories, specifically related to forests and forest conversion, which is provided as supplemental information. Prior to data and methodology updates in the last several years, Vermont included only information on aboveground forest biomass as an indicator of carbon sequestration potential. In order to inform, track, and better understand the carbon implications of programs and policies related to NWL, improvements must be made to the inventory estimates. This work to improve the NWL sector estimates and datasets is ongoing in Vermont through the GWSA process, internal work of state agencies, and through USCA Working Groups.

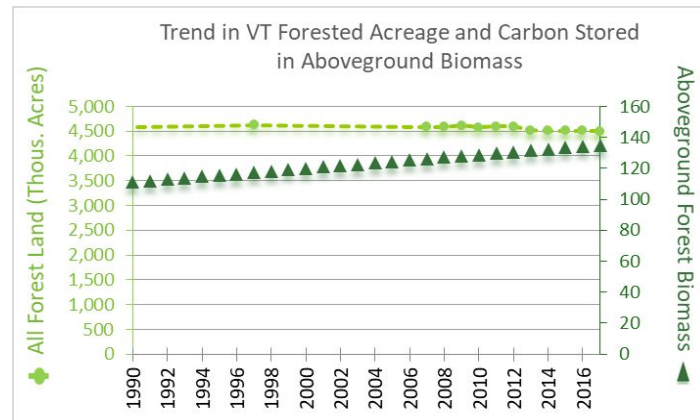
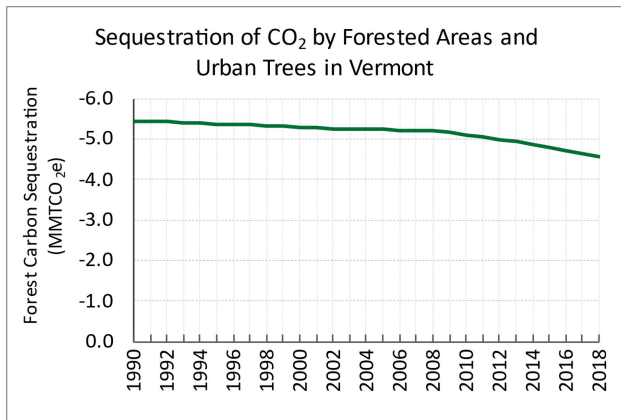
# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Vermont (continued)

#### NWL GHG Inventory and Net Zero

The NWL sector is incredibly important in Vermont, but tracking changes in this space has been a challenge. Vermont has been using EPA's State Inventory Tool (SIT) to attempt to quantify carbon fluxes from the land-use, land use change, and forestry (LULUCF) sector, but there has historically been a lack of confidence in default data in the tool. This lack of confidence has led to Vermont only including portions of the NWL estimates related to forests as supplemental information in the GHG inventory. With ongoing work by the US Forest Service and EPA to improve the data in SIT, this confidence is increasing, but issues remain with quantifying carbon fluxes on a granular enough level to accurately reflect the impacts from or to inform new NWL policies.



Source: [Vermont GHG Emissions Inventory Update and Forecast \(1990 – 2017\)](#)



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Vermont (continued)

#### NWL GHG Inventory and Net Zero

For the past several years, Vermont has been using data from the US National GHG Inventory downscaled to Vermont, which has now been incorporated into the SIT. Work is underway to improve and expand upon the LULUCF/AFOLU sector in the state with specific focuses on improving estimates for the agricultural and forest components. It is expected that the updated LULUCF/AFOLU sector in the next iteration of the GHG inventory report will still rely on use of the SIT. There are, however, several additional resources and investigations Vermont is hoping to leverage to improve the default estimates in SIT. The first is the Vermont Carbon Budget, which was produced as a part of the GWSA process to improve the understanding of all carbon sources and sinks related to AFOLU sectors in Vermont. Second is a grant, funded by USCA, to investigate and explore methodologies to accurately account for agricultural emissions in Vermont, with a specific focus on accounting for agricultural management practices. And the third is another USCA grant funded regional project related to net zero accounting, with a specific focus on forests and forestland. Establishing a baseline and gaining a more complete and robust understanding of the data, details, nuances, and challenges of estimating carbon pools and fluxes in the NWL space is important to understand policy decisions and impacts, and Vermont is working to improve and expand upon our estimates related to NWL through further investigations and regional collaboration.

#### Vermont forest carbon sequestration estimate (2017)

Forest Land Remaining Forest Land (MMTCO2e)	2017
Aboveground Biomass	-3.53
Belowground Biomass	-0.68
Dead Wood	-0.86
Litter	-0.04
Soil (Mineral)	-0.22
Soil (Organic)	0.00
Drained Organic Soil	0.00
Total wood products in landfills	-1.11
<b>Total</b>	<b>-5.33</b>

Land Converted to Forest Land (MMTCO2e)	2017
Aboveground Biomass	-0.15
Belowground Biomass	-0.03
Dead Wood	-0.03
Litter	-0.10
Soil (Mineral)	0.00
<b>Total</b>	<b>-0.30</b>

Forest Land Converted to Land (MMTCO2e)	2017
Aboveground Biomass	0.64
Belowground Biomass	0.13
Dead Wood	0.09
Litter	0.25
Soil (Mineral)	0.01
<b>Total</b>	<b>1.13</b>

<b>Urban Trees (MMTCO2e)</b>	<b>-0.13</b>
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<b>Net Forest Carbon Flux</b>	<b>-4.63</b>
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# Strategies to Enhance the Contribution of NWLs to Climate Action

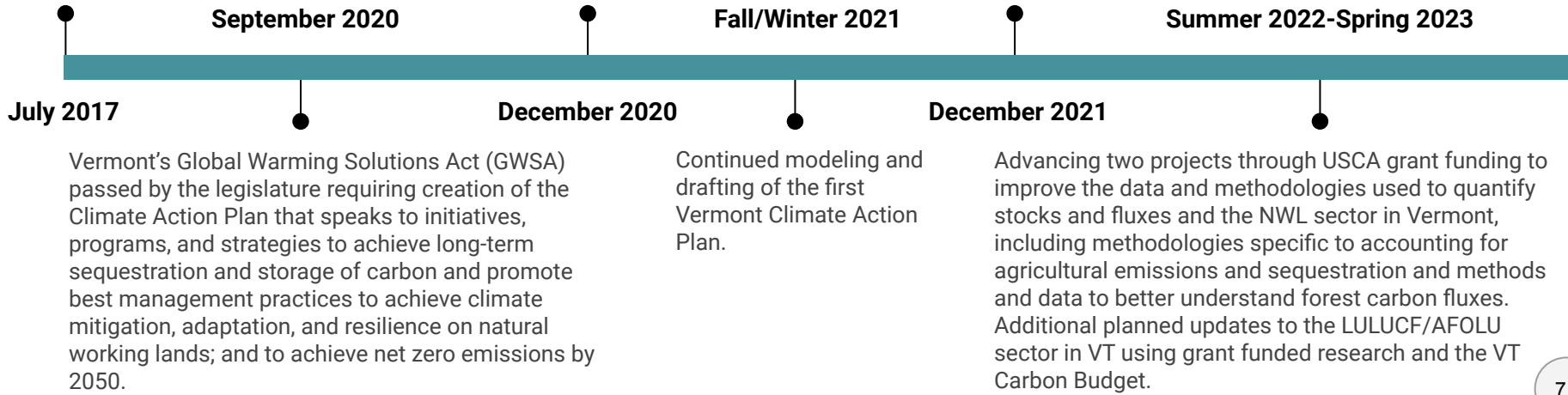
## 2. Examine NWL Sources and Sinks

### Case Study: Vermont (continued) NWL GHG Inventory and Net Zero—Key Milestones

Vermont Greenhouse Gas Inventory release includes first updated forest carbon sequestration estimate using downscaled National Inventory Report data for “Forest Land Remaining Forest Land” category.

First meeting of the Vermont Climate Council (established under the GWSA to create the Climate Action Plan). Many subcommittees meeting and technical analyses to inform pathways, including creation of the Vermont Carbon Budget.

Release of first Vermont Climate Action Plan including pathways and recommendations related to NWL adaptation, mitigation, and resilience strategies, as well as recommendations around tracking and quantifying changes related to NWL.





# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Colorado

#### Using SIT and State-Specific Wildfire Data to Develop a NWL GHG Inventory

Colorado developed a LULUCF GHG inventory for inclusion in the statewide [2021 GHG Inventory Report](#). The NWL GHG inventory was produced using SIT along with state-specific data for wildfire acres burned. As noted in the report, "the LULUCF module estimates CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions and CO<sub>2</sub> sequestration from forests, urban trees, landfills, and agricultural cropland and grassland, and takes into account certain emissions from forest fires, and emissions from fertilization of settlement soils." The LULUCF inventory is reflective of 2005-2018.

In 2021, Colorado released a [Greenhouse Gas Reduction Roadmap](#), which details actions that the state will pursue to enhance the contribution of NWLs to state climate goals: "develop a comprehensive emissions inventory" (XVIII).

By developing a robust NWL GHG inventory, Colorado will be able to more effectively promote carbon-smart management strategies and evaluate tradeoffs with other policy priorities.

**Exhibit 11-1: Estimated CO<sub>2</sub>e Emissions/Sinks from Land Use, Land Use Change and Forestry**

Emissions (MMTCO <sub>2</sub> e)	2005	2010	2015	2018*
<b>Forest Carbon Flux</b>				
Aboveground Biomass	16.55	16.987	17.398	17.578
Belowground Biomass	3.604	3.706	3.802	3.848
Dead Wood	-10.266	-10.444	-10.597	-10.631
Litter	1.113	1.149	1.176	1.169
Soil (Mineral)	-1.234	-1.253	-1.269	-1.291
Total Wood products and landfills	-0.556	-0.556	-0.556	-0.556
<b>Subtotal Forest Carbon Flux</b>	<b>9.211</b>	<b>9.59</b>	<b>9.954</b>	<b>10.116</b>
Urban Trees	-0.359	-0.391	-0.424	-0.443
<b>Landfilled Yard Trimmings and Food Scraps</b>				
Grass	-0.008	-0.012	-0.012	-0.01
Leaves	-0.054	-0.066	-0.064	-0.052
Branches	-0.05	-0.062	-0.06	-0.049
Landfilled Food Scraps	-0.061	-0.051	-0.047	-0.046
<b>Subtotal Yard Trimmings and Food Scraps</b>	<b>-0.172</b>	<b>-0.191</b>	<b>-0.183</b>	<b>-0.158</b>
<b>Forest Fires</b>				
CH <sub>4</sub>	0.47	0.417	0.277	2.702
N <sub>2</sub> O	0.087	0.078	0.052	0.503
<b>Subtotal Forest Fires</b>	<b>0.557</b>	<b>0.494</b>	<b>0.329</b>	<b>3.205</b>
N <sub>2</sub> O from Settlement Soils	0.053	0.064	0.059	0.059
Agricultural Soil Carbon Flux	-4.977	-3.113	-2.275	-2.904
<b>Total (MMTCO<sub>2</sub>e)</b>	<b>4.314</b>	<b>6.453</b>	<b>7.46</b>	<b>9.875</b>

\*Year of latest available data.

Source: [2021 CO GHG Inventory Report](#)



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Colorado (continued) Using SIT and State-Specific Wildfire Data to Develop a NWL GHG Inventory

Colorado begins developing the state's NWL GHG inventory for inclusion in the 2021 statewide [2021 GHG Inventory Report](#).

Colorado releases the state's [Greenhouse Gas Pollution Reduction Roadmap](#).

[HB22-1012](#) requires the state forest service to "develop a publicly accessible statewide carbon accounting framework that yields carbon stock and flux estimates for ecosystems by county and forest carbon type and wood products."

(Planned) Colorado develops and releases Greenhouse Gas Pollution Reduction Roadmap 2.0, informed by NWL Plan.



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 2. Examine NWL Sources and Sinks

### Step 2: Develop an Enhanced NWL GHG Inventory to Examine NWL Sources and Sinks with State-Specific Data

SIT, which is free and easy to use, can provide a critical starting point for states to understand the sources and sinks associated with the NWL sector, as well as the sector's contribution to the state's gross emissions. In recent years, key updates have improved the tool, most notably the integration of National GHG Inventory (1990-2019) data. However, SIT still has limitations (see slide [66](#)) and, depending on a state's goals/targets, might not be a robust enough tool to track progress towards NWL goals/targets.



**Key Point:** While SIT is considered the default method for states compiling GHG inventories, due to the tool's limitations, if possible—and with support from the federal government and others (see slide [85](#))—states should build on SIT by integrating additional data, as well as investing, if possible, in collecting new data and/or processing and analyzing existing data.



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: Massachusetts

#### Developing the State's First NWL GHG Inventory

In 2021, the Act Creating a Next Generation Roadmap for Massachusetts Climate Policy (2021 Climate Law) required the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) to track “the release of measurable greenhouse gases from and carbon sequestration by natural and working lands and the products derived from these lands to the maximum extent practicable” and include in the 2025 and 2030 Clean Energy and Climate Plan (2025/2030 CECP) a baseline estimate of NWL carbon fluxes in Massachusetts, statewide goals to reduce NWL GHG emissions and increase carbon sequestration, and an NWL plan that outlines actions to achieve these statewide goals (Chapter 8 in [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#)).

To meet the requirements of the 2021 Climate Law and support the goals and actions in the 2025/2030 CECP, EEA developed the state's first NWL GHG inventory in 2022. Prior to the development of this sector-specific inventory, the state was tracking only carbon dioxide (CO<sub>2</sub>) emissions from forest land use conversion (i.e. deforestation) and sequestration of CO<sub>2</sub> from net forest growth.

### Massachusetts' Inventory of Estimated NWL GHG Emissions and Sequestration in 2019

Land Classes / Reporting Categories	Net Emissions (MMTCO <sub>2</sub> e/year)	
	2019	
<b>Forest Land</b>	<b>-5.8</b>	
Forest Ecosystem		-4.6
Harvested Wood Products		-0.7
New Forest Land		-0.6
<b>Cropland &amp; Grassland</b>	<b>0.3</b>	
<b>Wetlands</b>	<b>-0.2</b>	
Coastal Wetlands		-0.2
Inland Wetlands		TBD
<b>Settlements</b>	<b>-1.3</b>	
Settlement Biomass		-2.7
Settlement Soils		0.9
New Settlement Land		0.5
<b>Net NWL Emissions</b>	<b>-7.0</b>	

Note: Subtotals shown may not sum to the total due to rounding.

Source: [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#)



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 2. Examine NWL Sources and Sinks

### Case Study: Massachusetts (continued)

#### Developing the State's First NWL GHG Inventory

Massachusetts' NWL GHG inventory generally follows the methods and reporting conventions developed by the Intergovernmental Panel on Climate Change for Agriculture, Forestry, and Other Land Use emissions inventories and used by the US Environmental Protection Agency (EPA) in the US National GHG Inventory for Land Use, Land Use Change, and Forestry (LULUCF). The primary data source for emissions estimates in the state's NWL GHG inventory is the EPA's state-level disaggregation of the US National GHG Inventory for LULUCF. The EPA's State Information Tool was used for a few categories (e.g. Harvested Wood Products). All categories with consistent, Massachusetts-specific and -relevant reporting and with emissions  $>0.005$  MMT CO<sub>2</sub>e/yr are included. A few exclusions were made due to state-specific situations (e.g. Landfilled Yard Trimmings, as landfilling yard trimmings is illegal in Massachusetts) or incomplete data (Inland Wetlands, where EEA is developing its own emissions inventory methodology). Additional details on the state's NWL GHG inventory can be found in [Appendix C of Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#).

# Strategies to Enhance the Contribution of NWLs to Climate Action

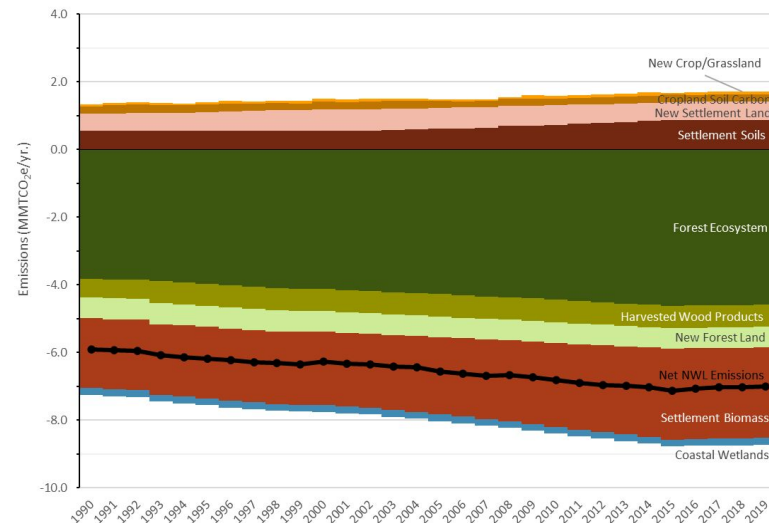
## 2. Examine NWL Sources and Sinks

### Case Study: Massachusetts (continued)

#### Developing the State's First NWL GHG Inventory

Massachusetts' NWL GHG inventory established a baseline for the state and a trajectory against which future changes can be assessed. For example, the inventory demonstrates that net emissions in the state have been decreasing (i.e. carbon sequestration is increasing). Additional research and analysis informed the state's understanding that through tree-planting and forest protection measures, Massachusetts can likely at least maintain the current level of carbon sequestration over the next decade. This information, together with a stakeholder and expert workshop and internal discussions, shaped the state's 2025/2030 CECP NWL goals, including its first ever NWL emissions goal (page 91 of [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#)).

### Massachusetts NWL GHG Emission Estimates by Sub-Category Over Time, 1990-2019



Source: [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#)

Note: Massachusetts also has a more detailed version of its NWL inventory reporting annual emissions for 13 subcategories going back to 1990 (see [Appendix C of Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#))

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

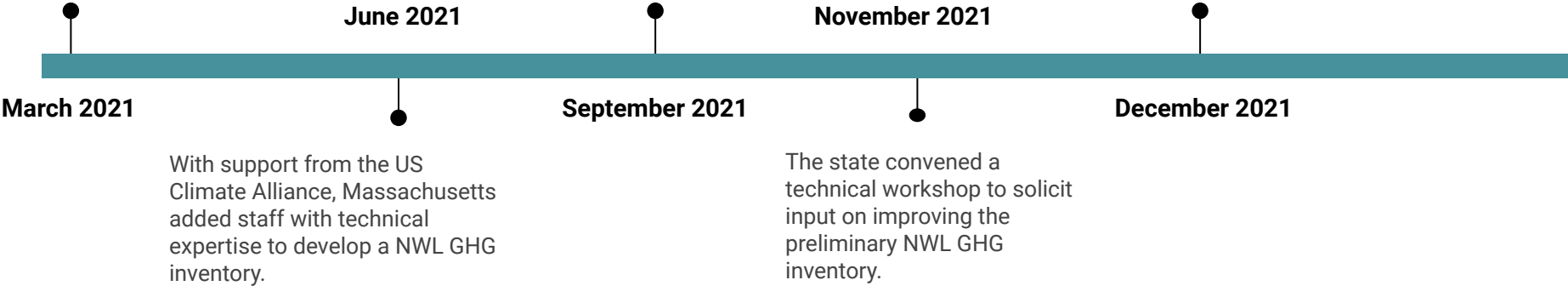
### Case Study: Massachusetts (continued)

#### Developing the State's First NWL GHG Inventory—Key Milestones

The Act Creating a Next Generation Roadmap for Massachusetts Climate Policy is passed, directing Massachusetts agencies to track emissions and sequestration from NWLs. The NWL GHG inventory enables the fulfillment of other Climate Roadmap requirements, including adopting NWL sequestration goals and development an NWL plan to meet those goals (as part of CECPs).

Massachusetts developed a preliminary NWL GHG inventory using SIT.

Massachusetts contracted a research team to update its Decarbonization Roadmap Land Sector Report and model future forest carbon sequestration under alternative forest management, ecological disturbance, and land use scenarios. This ongoing work will inform the state's 2050 CECP and includes collaboration with EEA on improvements to its NWL GHG inventory.



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

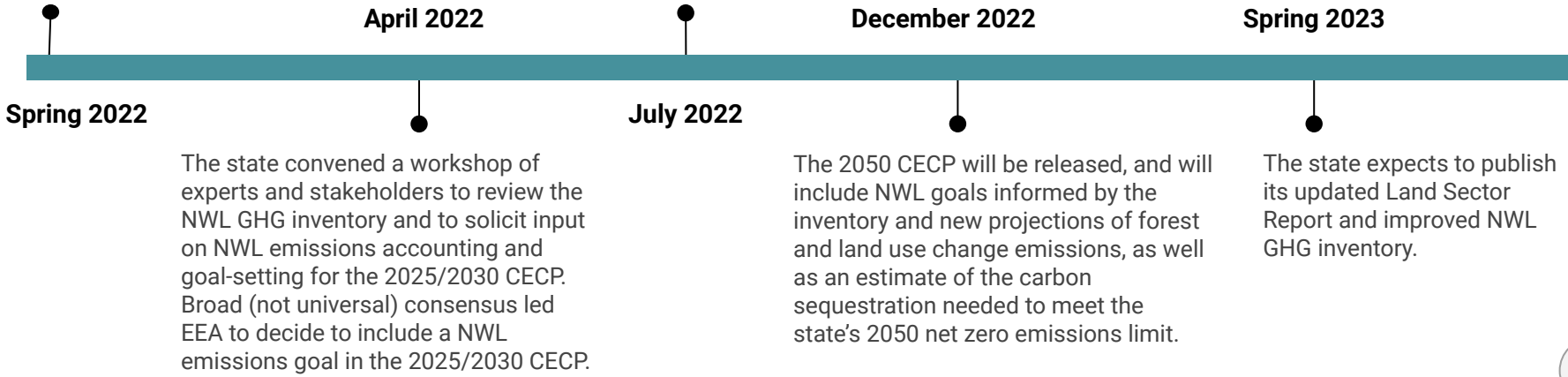


### Case Study: Massachusetts (continued) Developing the State's First NWL GHG Inventory—Key Milestones

A two-part strategy for developing the state's NWL GHG inventory is established: 1) an initial version for use in the 2025/2030 and 2050 CECPs, based mostly on EPA state-level data and 2) a more detailed version based on additional research, expert review, geospatial data, and state- or region-specific emissions factors, to be released in 2023.

Massachusetts released the Clean Energy and Climate Plan for 2025 and 2030, including the state's first NWL GHG inventory and emissions goals.

Massachusetts set a NWL emissions goal in the [Clean Energy and Climate Plan for 2025 and 2030](#): "maintaining the current level of NWL net emissions through 2025 (estimated at -7.0 MMTCO<sub>2</sub>e per year) and achieving a net NWL emissions reduction of 25 percent below 1990 level by 2030 (estimated at -7.4 MMTCO<sub>2</sub>e per year)" (p. 92).



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Carbon Stocks\*

### Case Study: California

#### The Role of a NWL GHG Inventory in Goal/Target Setting

In 2018, the California Air Resources Board (CARB) released the state's official ecosystem carbon inventory (NWL Inventory), which utilized a combination of satellite-based and ground-measurement-based datasets to quantify the State's NWL carbon stocks. California's land base contains approximately 5,340 million metric tons (MMT) of carbon, the majority of which is in the state's forests and shrublands (see Figure 8).

In May 2022, CARB released a [Draft Scoping Plan Update](#) to guide the state's transition to a clean energy economy, drastically reduce the use of fossil fuels, achieve carbon neutrality by 2045 or sooner, and significantly clean the state's air.

The state's NWL GHG inventory was used in the development of the NWL target proposed in Draft Scoping Plan Update (-2% and -4% total carbon stock change from 2014 by 2035 and 2045, respectively), demonstrating the critical and foundational role that a NWL GHG inventory plays in understanding past and present NWL dynamics, as well as establishing and tracking a quantitative NWL goal/target.

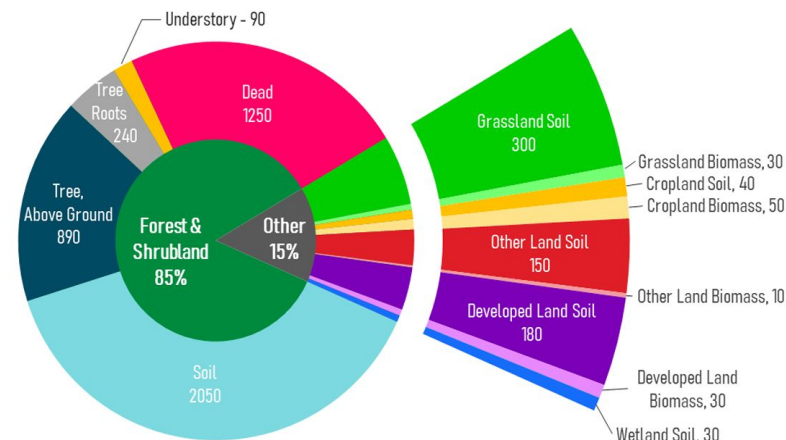


Figure 8: California's NWL carbon stocks  
Source: [An Inventory of Ecosystem Carbon in California's Natural and Working Lands 2018 Edition](#)

\* California's inventory methodology currently only outputs carbon stocks.

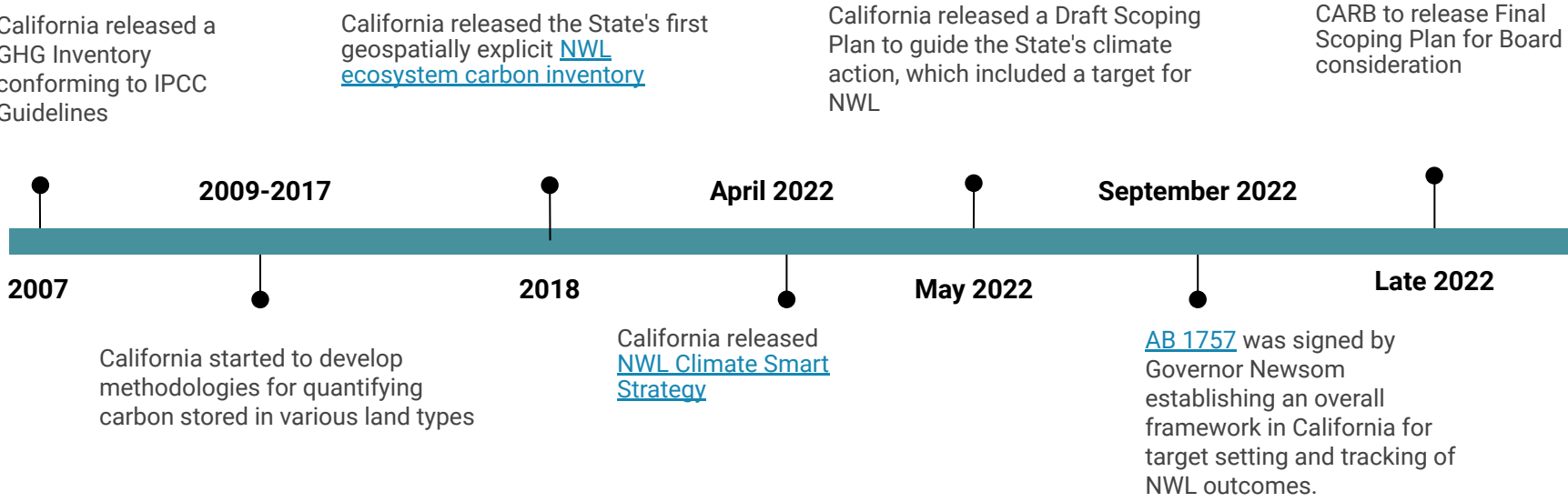


# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Carbon Stocks

### Case Study: California (continued)

#### The Role of a NWL GHG Inventory in Goal/Target Setting—Key Milestones





# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Carbon Stocks

### Case Study: California (continued)

#### The Role of a NWL GHG Inventory in Goal/Target Setting—Key Lessons Learned

##### AB 1757—Additional Information:

[AB 1757](#) establishes an overall framework in California for target setting and tracking of NWL outcomes. The legislation requires California to:

1. Set/update NWL carbon targets by January 1, 2024
2. Assess climate-smart NWL actions for carbon sequestration and other co-benefits by January 1, 2025
3. Create standard methods for tracking outcomes, including carbon stocks, carbon sequestration, and GHG emissions from NWLs statewide.
4. Establish an advisory committee with academic, practitioner, environmental justice, tribal, and other representatives.

##### Key Lessons Learned from Examining NWL Carbon Stocks:

- The science of quantifying NWL emissions and sinks is still developing; more research is still needed.
- NWL sequestration **and emissions** must be accounted for to truly understand NWL's contribution to a jurisdiction's overall emissions.
- Only set targets that can be tracked in your inventory, otherwise you can not effectively track progress towards your target.



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

### Case Study: New Mexico

#### Forest Carbon Study to Inform Statewide Carbon Accounting and NWL GHG Inventory

With support from the Alliance's technical assistance fund, the New Mexico Energy, Minerals and Natural Resources Department is partnering with NASA, University of Maryland, and University of New Mexico to determine precise and accurate estimates of carbon storage and fluxes for New Mexico's forests. These estimates are crucial for informing GHG reduction initiatives and integrating NWLs into statewide carbon accounting.



University of Maryland researchers are using remote sensing data from NASA's Carbon Monitoring System (CMS) to determine a baseline inventory for the amount of carbon sequestered in New Mexico's forests, estimate historical yearly carbon fluxes, and assess future forest carbon sequestration options.



University of New Mexico researchers operate a network of flux towers that will help parameterize and refine the CMS model output and aid in scaling the data relevant to New Mexico's forested ecosystems.

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 2. Examine NWL Sources and Sinks

### Key Points:

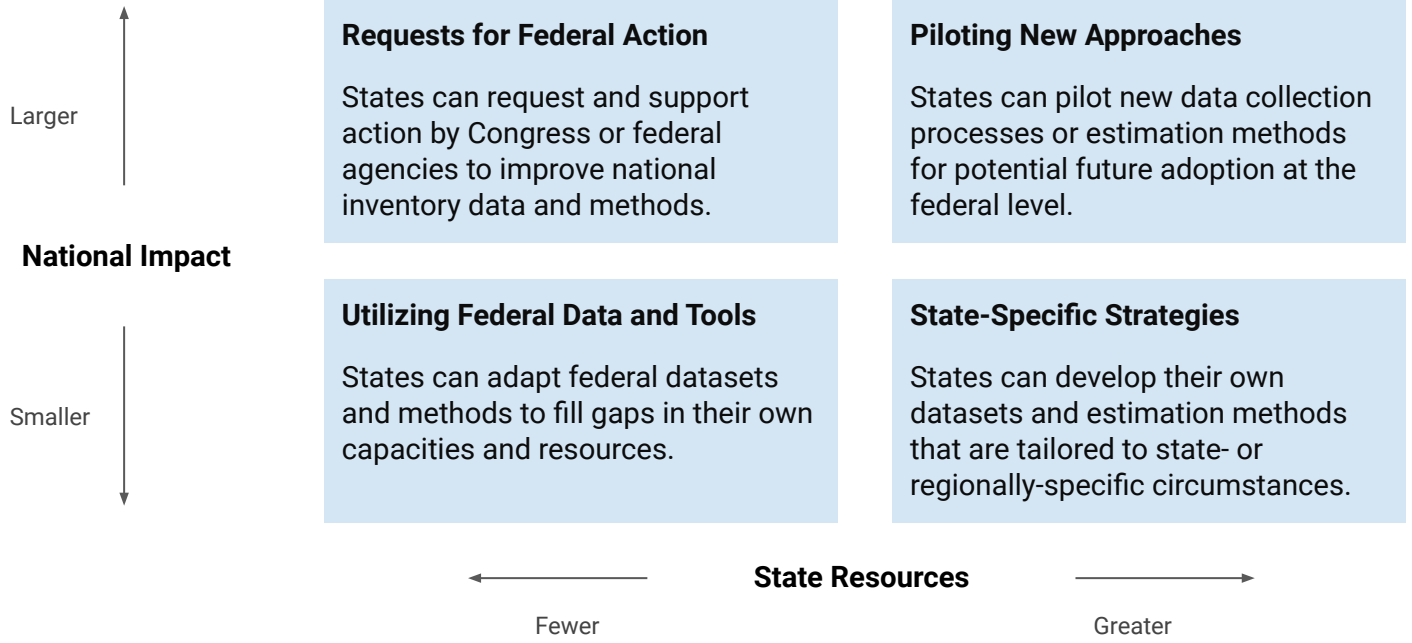
- Given the critical role that state inventories play as a mechanism to assess and communicate the state's carbon sequestration and mitigation, states, with support from the federal government, NGOs, and universities, should continuously be working to improve their NWL inventories. Additional information on how states can improve their NWL inventories can be found in [Natural and Working Lands Inventory Improvements: A Guide for States](#).
- NWLs are a natural system and the uncertainty of estimating GHG flux for many NWL categories—including forests, cropland and grassland soils, and land use change—is disproportionately large compared to other sectors in the National GHG Inventory. This uncertainty can be magnified in state inventories due to smaller pools of sample data and less state-specific calibration of models ([WRI](#)).



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 2. Examine NWL Sources and Sinks

**Strategies to Improve GHG Inventories include:**





## Strategies to Enhance the Contribution of NWLs to Climate Action

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### 3. Assess the Role that NWLs could Play in a State's Climate Strategy



**Strategy Objective:** Conduct qualitative and quantitative analyses of the potential role NWLs could play in a state's climate strategy



**Step 1:** Consider how land type, land use, and land ownership and governance—and any changes or stressors to these factors—shape state NWL climate action pathways (policies, practices, and programs)



**Step 2:** Evaluate the role that NWLs could play in reducing emissions and increasing carbon sequestration in a state, including through specific climate action pathways

**Basic:** Draw on existing resources

**Enhanced:** Conduct a pathways analysis

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

**Step 1:** Consider how land type, land use, and land ownership and governance—and any changes or stressors to these factors—shape state NWL climate action pathways (policies, practices, and programs)

### A. Land Type

Each NWL land type (forests and woodlands, grassland and shrubland, cropland and rangeland, wetlands, and urban green spaces) contributes to the overall strength of the sector as a net sink—or a net source. Understanding a state's land types will, alongside other considerations (see slides [110-116](#)), inform which NWL climate action pathways the state should pursue to enhance the contribution to state and national climate goals.

#### **Case Study: Maine and Illinois**

Maine is 35,385 mi<sup>2</sup> and [89 percent forested](#). According to the [US State Natural Climate Solutions Mapper](#) tool, the greatest carbon gain potential from a natural climate solutions (NCS) strategy in Maine is reforestation (3.21 Mt CO<sub>2</sub> per year with 1.3 million available acres).

Illinois is 57,915 mi<sup>2</sup> and one of the largest agricultural producing states in the United States. According to the [US State Natural Climate Solutions Mapper](#) tool, the greatest carbon gain potential from a NCS strategy in Illinois would be cover cropping (7.41 Mt CO<sub>2</sub> per year with 15.6 million available acres).



**Key Point:** The land types in a state will inform which NWL climate action pathways a state chooses to pursue to enhance the contribution of NWLs to climate goals.



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### A. Land Type (continued)

Ecological factors such as disease, drought, and wildfire can impact the strength of a state's net carbon sink. These factors, as well as others, such as sea level rise and the increased variability of temperature and precipitation, are impacted by climate change. As such, to assess the potential role that NWLs could play in a state's climate strategy, states must examine how ecological stressors induced by climate change will impact the NWL climate action pathways a state pursues to enhance the contribution of NWLs to state climate goals.

#### **Case Study: California**

Based on modeling in [California's Draft 2022 Scoping Plan Update](#), carbon stocks in the state will decrease in the coming decades due to a combination of past unhealthy management practices and the impacts of climate change on NWLs (e.g., wildfire). To address this anticipated decline, the Scoping Plan Update proposes new carbon stock targets for NWL that are based on increasing the pace and scale of climate-smart land management practices in California (-2 percent and -4 percent total carbon stock change from 2014 by 2035 and 2045, respectively). To meet these targets, the state will implement NWL actions in all NWL sub-sectors.

#### **Case Study: Minnesota**

Northern Minnesota is experiencing the impacts of climate change: between 1895 and 2018, temperatures have [increased 2 degrees Celsius to 3 degrees Celsius](#). To help the state's northern forests adapt to the changing climate, the [Forest Assisted Migration Project](#) (FAMP), a collaboration of non-state partners (university and non-profits) is 1) collecting tree seeds, 2) forming a network of farm and forest growers to collect climate-adaptive tree seeds, and 3) establishing partnerships and purchase agreements with reforestation agencies. FAMP also produces educational and outreach materials on farmer finance, how and when to collect seeds, and much more.





# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State’s Climate Strategy

### B. Land Use

Competing demands for land use have significant implications for the ability of NWLs to store carbon over time. Examples of various land uses include crop production, livestock grazing, timberland, recreation, and habitat preservation, as well as commercial, residential, and industrial uses that compete with NWLs.

Assessing competing land use priorities and tradeoffs is a critical part of understanding the potential role NWLs could play in a state's climate strategy. For example, certain practices may yield carbon gains but sacrifice food production. Other strategies may help a state reach a renewable energy target but require putting solar panels on highly productive agricultural lands, leading to a decrease in food production and reduced potential for carbon sequestration. Navigating these tradeoffs to understand the potential contribution of NWL to climate goals is a complex process that must center equity, stakeholder engagement, collaboration, and ongoing research.

#### Direct Carbon Gains, Less Food or Fiber

- Reforesting Unproductive (or Marginal) Farmland
- Restoring Cropland to Grassland
- Timber Harvest Reduction

#### Direct Carbon Gains, No/Negligible Impact on Food or Fiber

- Urban Forestry
- Cover Cropping
- Grazing optimization
- Improved Forest Management

#### Direct Carbon Gains, Potential Increase in Food or Fiber

- Reforesting Non-Farmland
- Forest Restocking
- Avoided Forest Loss via Smart Growth
- Fire Management

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### C. Land Ownership and Governance

States and the federal government have varying authorities over private land management via regulations and standards/outcome-based programs. Examples of regulatory governance mechanisms include the Clean Water Act (state and federal), nutrient loading and sedimentation (state and federal), Endangered Species Act (state and federal), and timber harvest rules (state).

Given the patchwork of land ownership and the delegation of land use authority to local governments, states also need to establish mechanisms to collaborate with different levels of government and landowners, including federal and local governments, land trusts, and private landowners.

For example, as shown by the [Reforestation Hub](#) tool (Figure 9 and 10), the greatest carbon gain potential from NCS is overwhelmingly on private lands in Wisconsin and on federal lands in Nevada. These varying land ownership and governance structures will impact how each state assesses the role of NWLs in its climate strategy.

#### Wisconsin

##### Ownership ⓘ

Ownership	CO <sub>2</sub> (t/yr)	Acres
Total opportunity	5.18 M	3.12 M
Federal	13,300	9,220
State	51,300	35,300
Private	5.04 M	3.03 M
Other	74,400	49,400
US Forest Service	8,600	5,800
Bureau of Land Mgmt	0	0

Figure 9: Land ownership in Wisconsin

#### Nevada

##### Ownership ⓘ

Ownership	CO <sub>2</sub> (t/yr)	Acres
Total opportunity	2.26 M	1.44 M
Federal	1.51 M	871,000
State	7,320	6,620
Private	553,000	449,000
Other	184,000	105,000
US Forest Service	278,000	170,000
Bureau of Land Mgmt	1.2 M	679,000

Figure 10: Land ownership in Nevada

Source (Figure 8 and 9): [Reforestation Hub](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### Case Study: Maine, North Carolina, and Vermont

#### Integrating Private Lands into State Climate Plans

Maine is the most forested US state, with forests covering 89 percent or 17.5 million acres in area, resulting in a large capacity to store carbon. Nearly 95 percent of Maine's forest is privately owned. The state also has vibrant farm and coastal and marine environments with the capacity to grow carbon storage. According to the state's latest greenhouse gas emissions and carbon budget, Maine's natural and working lands and waters sequester 13.56 MMTCO<sub>2</sub>e annually, equivalent to 75 percent of Maine's 2016 gross anthropogenic emissions (17.97 MMTCO<sub>2</sub>e).

Maine's state climate plan, [Maine Won't Wait](#), found that despite this high capacity to store carbon, 10,000 acres of Maine's natural and working lands are lost to development each year, a figure that is projected to grow in the future. Maine Won't Wait proposed several strategies to slow the loss of natural and working lands and enhance carbon sequestration, including goals to achieve 30 percent conservation by 2030, incorporate emissions mitigation and climate resilience criteria into state conservation funding, develop a comprehensive inventory of carbon stocks on land and in coastal areas, develop incentives to encourage adoption of climate-friendly practices and investment in Maine's forests and farms, and more.



Source: Pam Wells, Wells Demonstration Forest, Milford, Maine

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### Case Study: Maine, North Carolina, and Vermont (continued)

In North Carolina, forests cover 42 percent of the state, of which 85 percent are privately owned. Forests in North Carolina currently sequester 37.8 MMT CO<sub>2</sub>e/year, equivalent to 25 percent of the state's gross GHG emissions.

Given the potential of forests to sequester carbon, one recommendation in the state's NWL Action Plan is to encourage restoration and reforestation on private lands. One strategy the state is proposing is to implement a state-level program to create accessible opportunities for private landowners to participate in carbon offset and ecosystem services markets.

In Vermont, forests store over 1.7 billion Mt of CO<sub>2</sub>e and sequester more than 5 million Mt CO<sub>2</sub>e/year ([Initial Climate Action Plan, 2021](#)). 80 percent of forestland in the state is privately owned. As such, one strategy proposed in the Vermont's [Initial Climate Action Plan \(2021\)](#) is to leverage market-based solutions to incentivize climate-smart forest management practices.

North Carolina Land Cover Types by Area and Distribution of Forest Ownership

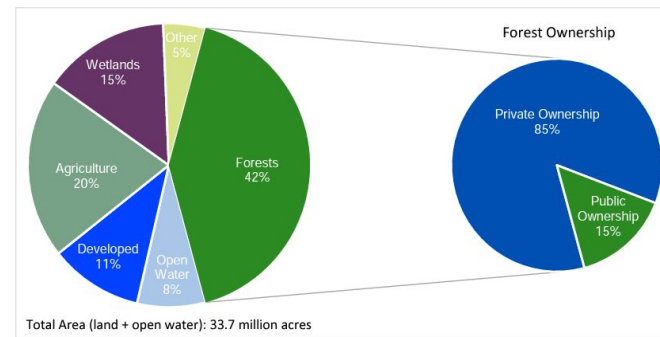


Figure 11: Land Cover Types and Ownership Distribution in North Carolina  
Source: [North Carolina Natural and Working Lands Action Plan](#)



**Key Point:** Given the role of forests as a carbon sink in many Alliance states, many states include recommendations in climate action plans for how to better manage and protect privately-owned forest lands.

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

**Step 2:** Evaluate the role that NWLs could play in reducing emissions and increasing carbon sequestration in a state, including through specific climate action pathways (policies, practices, and programs)

**Basic:** Capitalize on existing resources and institutional processes

**Existing resources may include:\***

- State Climate Action Plan / Scoping Plan
- State NWL Action Plan
- State Deep Decarbonization Plan
- NGO and/or Academic Resources and Data

\* Some of these resources may be produced or commissioned by the state, while others may be resources produced by entities such as NGOs or academic institutions (see Foundational Principle 3).



**Key Point:** This step is specific to what *could* be done, not what *should* be done—a preliminary survey and analysis of existing resources/data that should later be followed by a more robust analysis. See Strategy 5 for additional information on how to determine which pathways (policies, practices, and programs) should be pursued to realize state climate action.

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 3. Assess the Role that NWLs could Play in a State's Climate Strategy



### Case Study: New York

#### Assessing the Potential Role NWLs could Play in the State's Economy-Wide Net-Zero Target

New York has a 2050 net-zero goal (compared to 1990). The state reports the land use sector in terms of total net emissions (emissions minus removals) in accounting for the net zero goal. In preparation for [New York's Draft Scoping Plan](#), which was released for public comment in early 2022, the state did not assess sector-specific goals/targets, but rather identified mitigation strategies for each sector, which will be used to inform sector-specific goals. Figure 11 (see next [slide](#)) is an example of how a state can examine the potential role of NWLs in the state's climate strategy—this data will help the state figure out how carbon sequestration on NWLs will contribute to the state's net-zero target.

This assessment (Figure 12), based on the Draft Scoping Plan, is just one part of many ongoing efforts to both establish a reference understanding of NWL sources and sinks in the New York (Strategy 2) and to assess the potential role that NWL could play in the state's climate strategy (Strategy 3), demonstrating how these strategies are iterative and linked.

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### Case Study: New York (continued)

Among other research initiatives, New York is funding a multi-year research project at Cornell University to measure carbon storage and methane and nitrous oxide emissions from different freshwater wetlands ecosystems in the state. This project will help address a dearth of regionally-specific data on freshwater wetlands and enhance New York's understanding of the emissions reduction and carbon sequestration potential of the NWL sub-sector. As a result, the state will be able to set more sector-specific goals/targets in support of its net-zero target.

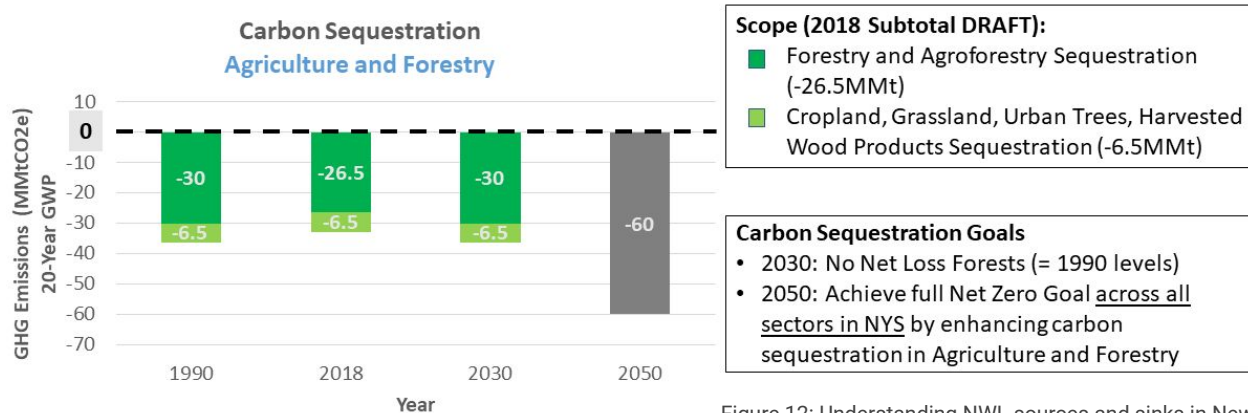


Figure 12: Understanding NWL sources and sinks in New York  
Source: [New York Draft Scoping Plan](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

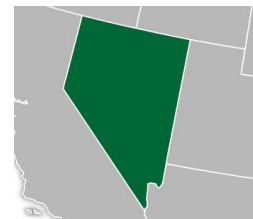
### Using Tools to Assess the Contribution of NWL Pathways (Policies, Practices, and Programs) to State Climate Goals

States can also use tools to evaluate the potential contribution of specific NWL practices—such as reforestation, avoided conversion, or alley cropping—to state climate goals/targets.

#### Case Study: Natural Climate Solutions Mapper

For example, the [US State Natural Climate Solutions Mapper](#), which was developed by [US Nature4Climate](#), provides national and state-specific data on the mitigation potential for 11 natural climate solution (NCS) pathways along with the marginal abatement cost per ton of CO<sub>2</sub>e per year for each practice (\$10, \$50, or \$100 per ton or not cost constrained).

**Note:** The US Natural Climate Solutions Mapper was developed using data from [Fargione et al., 2018](#).



**For example,** based on Carbon Mapper data, the greatest potential for carbon gain in **Nevada** is through reforestation.

Pathway	NCS Mitigation (Mt CO <sub>2</sub> per year)	Area Available (million acres)
Reforestation	0.96	1.72
Avoided Grassland Conversion	0.2	0
Cover Crops	0.12	0.25
Urban Reforestation	0.1	0.05
Alley Cropping	0.09	0.04
Improved Manure Management	0.07	N/A
Cropland Nutrient Management	0.04	N/A
Fire Management	0.04	0.28
Avoided Forest Conversion	0.03	0.02
Grassland Restoration	0.02	0.01
Improved Rice Cultivation	N/A	N/A

Figure 13: Mitigation potential of 11 NCS pathways  
Source: [US Nature4Climate](#)



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### Case Study: Reforestation Hub

The Nature Conservancy's [Reforestation Hub](#) is an interactive tool that shows the carbon sequestration potential of reforestation across the United States. The tool provides national and state-specific data on reforestation opportunities, including the approximate number of trees that could be planted and how much carbon could be sequestered annually by investing in reforestation. The tool delineates opportunities through reforesting corridors, floodplains, forests, marginal croplands, grassy areas, pasture, post-burn areas, shrub areas, streamside buffers, and urban open spaces. Reforestation Hub does not include information about the marginal abatement cost per ton of CO<sub>2</sub>e sequestered per year through reforestation.

For example, according to the Reforestation Hub, there are up to 2.33 million acres of opportunity in **Louisiana** to restore forest cover for climate mitigation. Reforesting these areas with approximately 1.4 billion trees could capture 7 million tonnes of CO<sub>2</sub> per year, equivalent to removing 1.51 million cars from the road.

**Note:** The Natural Climate Solutions Mapper and Reforestation Hub tools are intended to illustrate order-of-magnitude potential for carbon gain. Results can be used to prioritize efforts on the most impactful pathways and to consider appropriate state-wide mitigation targets. However, results should not be used for project-level planning.

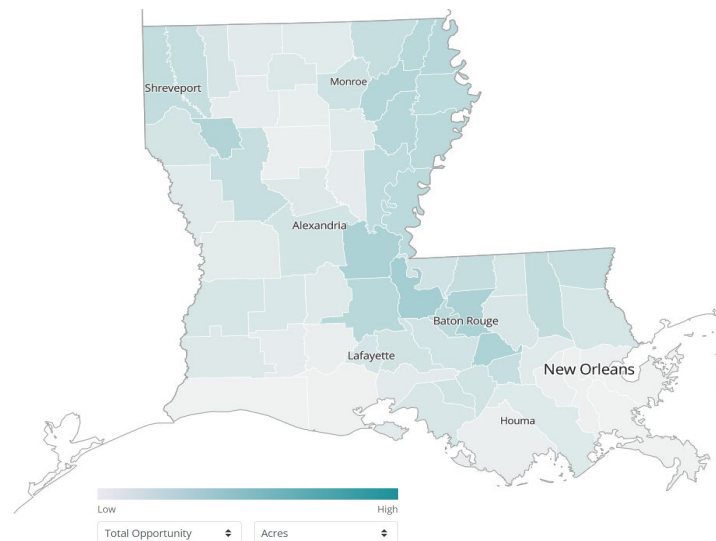


Figure 14: Carbon sequestration potential of reforestation in Louisiana  
Source: [Reforestation Hub](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### **Enhanced: Conduct a Pathways Analysis**

A pathways analysis is an important tool states can use to understand the practices and policies that could be pursued in support of emissions reductions and carbon sequestration goals/targets.

A pathways analysis:

1. Can be conducted at various scales (local, state, national, etc.) and can be sector-specific or economy-wide
2. Estimates emissions pathways in support of climate goals/targets
3. Examines different strategies to decrease emissions and, in the unique case of NWLs, increase carbon sequestration and storage
4. Often includes the expected costs associated with emissions reductions strategies
5. Integrates model policies and practices (e.g., land management strategies)
6. Includes an inherent amount of uncertainty—especially for NWLs—and should be updated regularly

**Note:** Even a robust pathways analysis will include significant uncertainty given the diversity and complexity of NWLs



**Key Point:** A pathways analysis allows states to take into account how ecosystem type, land use, and land ownership and governance—and any changes or stressors to these factors— could impact NWL climate action. See Strategy 5 for additional considerations that will inform the NWL climate action a state chooses to pursue.

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State’s Climate Strategy

### Case Study: National Pathways Analysis

In 2021, the [US Climate Alliance commissioned an Alliance-wide economy-wide pathways analysis](#) of collective emissions through 2050, which includes NWL. This analysis showcases the role NWL could play in reaching net-zero by 2050—a goal of many Alliance states.

This analysis relied on downscaled estimates from the latest national modeling efforts ([Second Biennial Report of the United States of America, 2016](#)).

**Note:** This analysis did not consider the implications of sector specific land use policies.

Similarly, some Alliance states are scoping or commissioning a state-specific pathways analysis to inform the development of policies, goal/target-setting, and implementation strategies.

GHG EMISSIONS IN THE COLLECTIVE ACTION SCENARIO COMPARED TO THE 2005 BASELINE

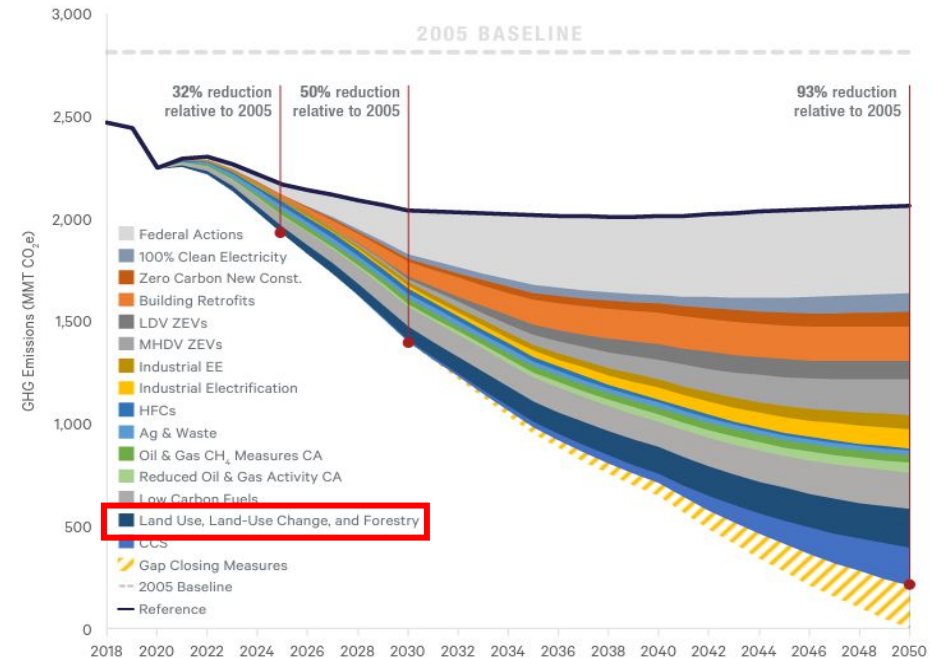


Figure 15: Economy-wide pathways analysis for Alliance states  
Source: [US Climate Alliance](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 3. Assess the Role that NWLs could Play in a State's Climate Strategy

### Case Study: [Energy Innovation—Energy Policy Solutions—US Energy Policy Simulator](#)

#### How Pathways Analyses have Catalyzed Emissions Reductions in the Energy Sector

The Energy Policy Simulator (EPS) is a free and open-source computer model that generates pathways analyses to help policymakers and regulators identify climate and energy policies that will reduce GHG emissions most effectively and with the most beneficial financial and public health outcomes. It provides much more flexibility than other models and can do so much faster, while accounting correctly for policy interactions. The model includes every major sector of the economy: transportation, electricity, buildings, industry, agriculture, and land use.

- EPS is customized for 10 countries and 9 US states (with more states [in development](#))
- In the US, EPS has been used to model the impacts of:
  - The [2022 Inflation Reduction Act](#)
  - The US adopting [top international climate policies](#)
  - The [House Select Committee on the Climate Crisis' action plan](#)
  - A [1.5 degrees Celsius pathway](#) for the US
- At the state level, EPS has been used to assess progress towards meeting climate targets (for example: [California](#), [Colorado](#), [Nevada](#), [Oregon](#)) or to help develop climate action plans (for example: [Louisiana](#))



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 4. Set a NWL Goal/Target

### **Strategy Objective:** Set a NWL Goal/Target

- There are many types of qualitative and quantitative, sector specific goals/targets that states can establish to enhance the contribution of NWLs to state climate goals/targets.
- The unique context of a state—social and cultural, environmental, economic, and political—will inform the type(s) of NWL goals/targets a state establishes.
- Given that NWLs are foundational to the social and cultural, environmental, and economic well-being of a state, states should set a diverse array of goals that enhance and fortify the many benefits NWLs provide.

### Key Characteristics of Effective Climate Goals and Targets



Transparent



Baseline Year



Clear Timeline



Opportunities to  
Recalibrate Ambition



Durable



Mechanisms to track,  
evaluate, and share progress



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 4. Set a NWL Goal/Target

Types of NWL Goals/Targets			
	Emission/Sequestration Goal(s)	Policy and Action Goal(s)	Complementary Goal(s)
Description	<p>A specific amount or change in net NWL emissions or a subset of NWL emissions (e.g., increase net carbon sequestration by X% or Y MMT CO<sub>2</sub>e/yr)</p> <p><b>Types of goals:</b></p> <ul style="list-style-type: none"> <li>• % increase in carbon sequestered</li> <li>• % reduction of GHG emissions</li> <li>• Tonnage goals (e.g., 5 MMT CO<sub>2</sub>e/yr or x MMT CO<sub>2</sub>e by 2030)</li> </ul>	<p>Land- or activity-based goals to implement natural climate solutions—practices that increase sequestration and/or reduce emissions on NWLs (e.g., protecting forestlands from development)</p> <p><b>Types of goals:</b></p> <ul style="list-style-type: none"> <li>• # acres restored</li> <li>• # acres protected</li> <li>• # acres conserved</li> </ul>	<p>Policies or actions that support, but do not directly contribute, to reducing net GHG emissions and/or are more focused on non-emissions-specific benefits of NWL actions (e.g., requirements to consider climate adaptation and environmental justice)</p> <p><b>Types of goals:</b></p> <ul style="list-style-type: none"> <li>• % invested in underserved communities</li> <li>• Biodiversity protection</li> <li>• Farmland conservation</li> </ul>
Benefit	Tangible and directly meaningful for climate action	Ability to track, evaluate, and share more easily than emissions or sequestration	Support a myriad of critical benefits (social and cultural, environmental, and economic)
Challenge	More difficult to measure accurately, set realistically and attribute to a particular change agent (e.g., a policy, practice, anthropogenic v. natural)	Net emissions changes associated with GHG policy and action goals are often not estimated, and accurately quantifying their effects on emissions can be challenging	Depending on the goal, can be difficult to quantify; weaker direct link to GHG mitigation
Examples	New York's Climate Action Council Draft Scoping Plan calls for -30 MMT CO <sub>2</sub> e by 2030	Massachusetts' goal to increase permanent land conservation of undeveloped land and water in the state to at least 28% and 30% by 2025 and 2030, respectively	<p>New York aims to build its "climate-focused bioeconomy by increasing market access for the state's low-carbon products and expand markets for sustainably harvested durable wood products</p> <p>At least 10 percent of trees planted through Maryland's <a href="#">Tree Solutions Now Act</a> must be planted in an underserved area (also an example of a GHG Policy and Action Goal*)</p>



# Strategies to Enhance the Contribution of NWLs to Climate Action

## 4. Set a NWL Goal/Target

### Examples of Alliance States' NWL Goals/Targets

State	NWL Goal/Target	Type of NWL Goal/Target	Action to Establish NWL Goal/Target
California	-2% and -4% total carbon stock change from 2014 by 2035 and 2045 respectively	Emission/Sequestration (carbon stock change)	Proposed target in <a href="#">2022 Draft Scoping Plan Update</a>
Hawai'i	Establish carbon smart land management assistance pilot program	Policy and Action; Complementary	<a href="#">Relating to Carbon Sequestration Incentives–SB3325 SD2 HD1 CD1</a>
Maryland	Average annual target of 550 acres of afforestation, 600 acres of reforestation, between 150,000 and 500,000 urban trees planted, and sustainable forest management on 38,000 acres of private land by 2030; At least 10% of trees planted through the <a href="#">Tree Solutions Now Act</a> must be planted in an underserved area	Policy and Action; Complementary	<a href="#">Greenhouse Gas Reduction Act Plan</a> <a href="#">Tree Solutions Now Act</a>
Michigan	30x30	Policy and Action	Recommended in <a href="#">MI Healthy Climate Plan (2022)</a>
New Mexico	Implement soil health principles	Policy and Action	The Healthy Soil Program was created after the <a href="#">Healthy Soils Act</a> was signed into law in 2019
New York	Aims to build the state bioeconomy	Complementary	Recommended in <a href="#">2022 Draft Scoping Plan</a>
Oregon	Sequester at least an additional five million MMT CO <sub>2</sub> e per year in Oregon's natural and working lands and waters by 2030, and at least 9.5 MMTCO <sub>2</sub> e per year by 2050 relative to a 2010 to 2019 activity based, business-as-usual net carbon sequestration baseline ( <a href="#">NWL Proposal</a> )	Emission/Sequestration	Proposed goal to Governor Brown in <a href="#">2021 NWL Proposal</a>
Wisconsin	Conserve 125,000 acres of forestland; plant 74 million trees in rural areas; plant 1 million trees in urban areas	Policy and Action; Complementary	<a href="#">Executive Order #112</a> (2021)

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### Three Strategies to Determine and Establish NWL Goals/Targets:

- 1 Establish new goals/targets
- 2 Repurpose existing goals/targets
- 3 Embed NWL goals/targets in existing pathways (policies, practices, and programs)

### Target Paralysis

While a target can help track and drive ambition, it is important not to let the act of establishing a target stymie action—a target does not need to be “perfect” to drive climate action. States can continue to advance no-regrets land management, conservation, and restoration strategies that build resilience and support equitable access to nature while reducing emissions and increasing carbon sequestration and storage.



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### 1 Establish New Goals/Targets

Based on the Foundational Principles and Strategies followed thus far, determine NWL goal(s)/target(s) for your state—a NWL emissions reduction goal/target, a net-zero economy-wide target that incorporates the role of NWL, or other quantitative or qualitative sector-specific goals/targets (see slides [102-103](#)).

- Determining the NWL goal(s)/target(s) for a state could be presented as a recommendation in a NWL Proposal/Scoping Plan, included in an executive order, put in front of the legislature, or a combination of these processes that relate to or trigger one another.

A state could also set an initial goal/target with a commitment to revisit and reevaluate the goal/target within a year (or other predetermined window of time) to assess if it needs to be further refined, expanded upon, etc. Note—the political and policy context of a state will be among the factors that will inform the goal/target a state can set.



**Key Point:** Even if a NWL goal is not a GHG target, there should be a clear link/understanding of how the goal will be supporting GHG reduction goals.



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### 2 Repurpose Existing Goals/Targets

If a state is unable to gain support for a GHG reduction or carbon sequestration goal/target, the state can leverage existing goals/targets to make progress on climate action.

**Examples of opportunities for states to repurpose existing goals or plans to embed a climate focus include:**

- **30x30**
  - If a state has 30x30 goal, it could integrate enhanced carbon sequestration as an explicit objective of the land conservation effort (e.g., by prioritizing the conservation of areas, like forests or peatlands, with high rates of sequestration).
- **State Forest Action Plan and State Wildlife Action Plan**
  - All states are required to submit State Forest Action Plans to receive funding authorized by the Cooperative Forestry Assistance Act of 1978 and State Wildlife Action Plans to receive funding through the State and Tribal Wildlife Grants Program, respectively. Developing these plans represents opportunities for cross-agency collaboration, as well as a chance for states to embed more ambitious climate goals, targets, or strategies in required state plans to enhance the contribution of NWL to state climate goals.



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### 2 Repurpose Existing Goals/Targets (continued)

Examples of opportunities for states to repurpose existing goals or plans to embed a climate focus include (continued):

- **Integrate NWLs into other sectoral pathways (policies, practices, and programs)**
  - States can embed NWL climate action in other sector-specific (e.g., transportation, land use, buildings) policies, programs, and plans to support a whole-of-government approach and maximize coordinated climate action. For example, statewide transportation plans could 1) prioritize investments in active and public transportation that encourage more location-efficient development and 2) integrate avoided land conversion as an environmental goal or criteria for project selection. Municipal planning departments could set an infill development goal and accelerated project review incentives for infill projects to minimize sprawl.
  - **Case Study: Colorado**
    - Colorado's forthcoming NWL Strategic Plan will include natural climate solutions as an opportunity to increase carbon sequestration and storage and reduce GHG emissions. In recognition of this strategy, the state's [Evaluation of Land Use Challenges and Opportunities](#) (July 2022)—a joint publication by the Departments of Transportation, Public Health and Environment, Local Affairs, Natural Resource, and Energy Office—notes that "reducing the conversion of natural lands to development through efficient land use planning, and employing climate-smart agricultural practices, are critical strategies for maintaining Colorado's land-based sink."



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### 3 Embed NWL Goals/Targets in Existing Pathways (Policies, Practices, and Programs)

If a state is unable to gain support for climate goals/targets, there are still opportunities to make progress on climate action. For example, by understanding stakeholders' priorities and values, states can embed climate action in policies or programs even if they are not explicitly climate-focused.

**Examples of opportunities to embed climate action in new or existing policies or programs include:**

- **Urban Heat**
  - States facing urban heat challenges in cities and small towns can use American Forests' [Tree Equity Score Tool](#) to identify and communicate how an urban tree planting goal would reduce surface temperatures, improve air quality, beautify neighborhoods, increase carbon sequestration, and more.
- **Adaptation and Resilience**
  - Alliance states are leaders on building adaptation and resilience to climate change. The US Department of Housing and Urban Development (HUD) National Disaster Resilience Competition (NDRC) was developed to help states address these challenges.
  - **Case Study: New Jersey and New York**
    - In 2016, [New Jersey and New York received a NDRC award](#) to address the impacts of recent flooding and to integrate natural buffers to protect against future flooding.



# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 4. Set a NWL Goal/Target

### 3 Embed NWL Goals/Targets in Existing Pathways (Policies, Practices, and Programs) (continued)

Additional examples of opportunities to embed climate action in new or existing pathways include:

- **Ecosystem Health**
  - Invasive insects and disease are impacting the health of NWLs across Alliance states, thus reducing their contribution as a carbon sink. To address this challenge, states can design an invasives management strategy that engages the public to raise awareness and galvanize support for investment in healthy ecosystems.
- **Case Study: Pennsylvania**
  - The Governor's Invasive Species Council works to identify invasive plant, insect, and animal species that currently threaten or could potentially threaten Pennsylvania's natural and agricultural resources and the industries they support. The Council develops and works to implement the Commonwealth's invasive species management plan, which provides a framework for the prevention and control of invasive species at the state level. The Council, which includes seven state agencies and 14 organizations, also advises the Governor on invasive species policy development, facilitates coordination between agencies and organizations to address invasive species threats, and conducts outreach and education. While the Council does not have a climate goal, by minimizing the loss of natural and agricultural resources to invasive species, the Council is ensuring that NWLs can continue to store and sequester carbon and provide social and cultural, environmental, and economic benefits.

# Strategies to Enhance the Contribution of NWLs to Climate Action

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## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

**Strategy Objective:** Evaluate priorities and tradeoffs to determine which implementation pathways (policies, practices, and programs) to pursue in support of climate goals/targets

In addition to the Strategies presented thus far, there are a myriad of other considerations that states should thoroughly assess to inform a state implementation strategy.

Factors states should examine to inform an implementation strategy include:

- Public priorities
- Ease of implementation
- Available capacity and funding/financing
- Health and economic impacts of NWL climate action

A **pathways analysis** is an important tool to understanding state opportunities—practices and policies—that could be pursued in support of emissions reductions and carbon sequestration goals/targets. Conducting this analysis will thus be a very helpful tool for assessing the role NWLs could play in a state's climate strategy (Strategy 3) and to inform the state's implementation strategy (Strategy 5).

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

### Case Studies: Washington, New York, California, and North Carolina

#### Examining Tradeoffs and Opportunities of NWL Climate Action

- Washington** commissioned the report "[Economic Impacts of Investing in Climate Resilience Through Ecosystem Restoration in Washington State](#)" to assess the economic impact of forest health and salmon recovery efforts in the state. See Figure 16 for an example of an analysis included in the report.
- New York** commissioned the report, "[Economic Impacts of Investing in Climate Mitigation in New York Forests and Agriculture](#)" to help guide the state's strategy to reduce GHG emissions by 85 percent by 2050. See Figure 17 for an example of an analysis included in the report.
- Cost-Benefit Analysis—**California, New York, and North Carolina**

#### Economic Impacts of Implementing the Washington Department of Natural Resources' Forest Health Strategies

	ANNUAL JOBS	ANNUAL WAGES (MILLION \$)	TOTAL ACRES (000)
<b>All Lands: Low</b>	1,518	\$67.6	933
<b>High</b>	2,572	\$112.4	1,343
<b>State Lands: Low</b>	199	\$9.9	336
<b>High</b>	272	\$13.6	432

Figure 16: Economic impacts of forest health strategies

#### Annual GHG Mitigation and Economic Impacts of Three GHG Mitigation Activities in New York State

	AFFORESTATION	REFORESTATION	DAIRY MANURE MANAGEMENT	TOTAL
<b>Abatement (MMT CO<sub>2</sub>e / yr)</b>	7.8	0.8	4.8	13.4
<b>Total Wages (MM 2020\$)</b>	\$133	\$43	\$13	\$188
<b>Total Jobs</b>	4,621	1,175	342	6,138

Figure 17: Annual GHG mitigation and economic impacts of mitigation activities

Sources: [Economic Impacts of Investing in Climate Resilience Through Ecosystem Restoration in Washington State](#) (Figure 16), [Economic Impacts of Investing in Climate Mitigation in New York Forests and Agriculture](#) (Figure 17)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

### Case Study: California

#### Conducting Economic and Health Analysis to Inform NWL Target-Setting

CARB established a NWL target setting approach to set a sector-specific carbon target. As evidenced in Figure 18, CARB's process focuses first on identifying multiple objectives that describe visions of what various stakeholders want from future NWL. These objectives then inform the development of statewide management strategies to achieve those objectives that are then modeled to quantify ecological and carbon outcomes.

After these outcomes have been modeled, extensive economic and health analysis are conducted. These studies include research on, for example, the costs and benefits of investing in land management strategies to reduce to wildfire emissions alongside ecological and carbon outcomes, to provide information for stakeholders, partners, members of the public, and CARB's board to identify the NWL carbon target ([Draft Scoping Plan](#)).

CARB's NWL Target-Setting Approach

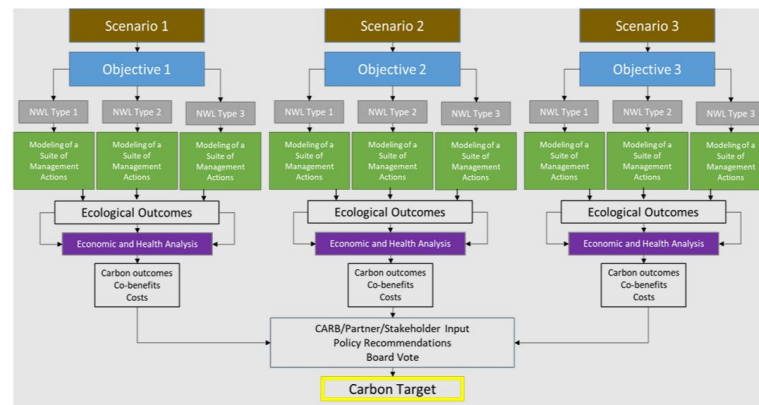


Figure 18: CARB's NWL Target-Setting Approach  
 Source: [Appendix I of the 2022 Draft Scoping Plan - Natural and Working Lands Technical Support Document](#)



**Key Point:** A cost-benefit analysis is one tool that can help states to more holistically evaluate the impacts (for climate goals and other objectives) of various NWL climate action strategies and look beyond only carbon.





# Strategies to Enhance the Contribution of NWLs to Climate Action

## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

### Case Study: New York

#### Conducting Cost-Benefit Analyses to Inform which Mitigation Strategies to Implement

New York signed the Climate Leadership and Community Protection Act (Climate Act) into law in 2019. The law created the Climate Action Council (the Council), which was tasked with developing a Draft Scoping Plan to serve as an initial framework for the state's climate strategy ([Climate Act](#)).

Sector-specific advisory panels, including for agriculture and forestry, were established to develop recommendations to guide New York's goal to meet statutory emissions limits. Included in the advisory panel's recommendations are cost-benefit analyses to help inform which mitigation strategies the sector should pursue. Each recommended mitigation strategy includes an analysis of the action type, emissions impact, ease of implementation, and cost. Below is an example of the summary information on Forest Mitigation Strategies developed by the Agriculture and Forestry Advisory Panel. More detailed information for each strategy is included in subsequent parts of the [Advisory Panel's Recommendations](#).

Initiative #	Description	Action Type	Emissions Impact	Ease of Implementation	Cost
1	Maintain and increase carbon sequestration in NYS forests by securing forest regeneration, improving forest health and productivity, and restoring degraded forests through the widespread adoption of improved, sustainable forest management practices	Statutory, Incentives	High. 3.3-11.0 million metric tons of CO <sub>2</sub> e per year	Medium	\$\$-\$\$\$
2	Increase forested acres through afforestation and reforestation efforts to establish climate adapted and resilient forests. There are potentially 1.7 million acres of marginal lands available for establishing forests.	Statutory, Incentives	High. 5-12 million metric tons of CO <sub>2</sub> e per year	Medium	\$\$\$

Figure 19: Forest Management—Assessing Mitigation Strategies Source: [Advisory Panel Recommendations \(A-132\)](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

### Case Study: North Carolina

#### Conducting Multi-Faceted Assessments of NWL Climate Action Strategies

In June 2020, North Carolina released a [Climate Risk Assessment and Resilience Plan](#), which includes a state [NWL Action Plan](#). The Plan presents recommendations for four categories of actions (Figure 20).



Figure 20: Recommendations in North Carolina's Natural and Working Lands Climate Action Plan  
Source: [North Carolina Natural and Working Lands Climate Action Plan](#)

Each recommendation included some or all of the following information—a variation of a **cost-benefit analysis**—to provide decision-makers and stakeholders with key details to guide the state's NWL implementation strategy:

1. Description of the issue and opportunity
2. Geographic Scope
3. Greenhouse Gas Impact
4. Ecosystem Resilience
5. Community Resilience
6. Economic and Health Benefits
7. Estimated Cost
8. Actors and Participants
9. Road Map for Action
10. Examples

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 5. Assess Tradeoffs and Opportunities for NWL Climate Action

### Case Study: Maryland

#### Drawing on Lessons Learned from Decades of Water Quality Initiatives to Inform Land Restoration and Management Strategies for Climate Goals

The [Chesapeake Bay Program](#) includes a diverse framework of partners, including federal and state agencies, local governments, non-profit organizations, and academic institutions. For nearly forty years, the Program has led and directed a regional effort to restore and protect the Chesapeake Bay.

The Maryland Department of the Environment (MDE) has worked closely with the Chesapeake Bay Program for decades and is seeking to improve on and apply lessons learned from the partnership to inform state implementation strategies to enhance the role of NWLs in state climate goals.

Successes of the program that MDE has identified to improve upon and integrate into state climate efforts include the following:

1. Develop a regional strategy (also building from existing climate mitigation collaboration under Regional Greenhouse Gas Initiative)
2. Collaborate with federal and state agencies, local governments, non-profit organizations, and academic institutions
3. Set science-based goals ([Chesapeake Bay Watershed Agreement](#) set goals and outcomes for the Program)
4. Establish mechanisms to transparently track, evaluate, and share progress ([ChesapeakeDecisions](#))



**Key Point:** States can draw on lessons learned from existing or recent efforts to inform which NWL climate action strategies to pursue.

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 6. Implement NWL Climate Action Strategies

**Strategy Objective:** Based on Strategies 1-5, develop an implementation plan to advance sustainable and equitable NWL climate action pathways (policies, practices, and programs) in support of economy-wide and sector-specific climate goals/targets.

**Note:** Part 5 of this Guide is devoted to the topic of implementation and includes sector-specific case studies that demonstrate how Alliance states are enhancing the contribution of NWL to state and national climate goals.

### Key Components of an Implementation Strategy include:

- 1 Engage and collaborate with key stakeholders
- 2 Establish a timeline with short- and long-term priorities and action
- 3 Track, evaluate, and share progress

No.	Limitation on Recommendations
1.	Develop actions with large potential for both carbon benefits and resilience.
2.	Focus on realistic options for North Carolina in the near-term by leveraging existing programs, authorities, resources.
3.	Utilize cost-effective and pragmatic solutions.
4.	Investigate long-term actions to create new and larger opportunities for NWL climate mitigation and resilience.

Figure 21: Recommendations from stakeholders regarding North Carolina's implementation strategy

Source: [North Carolina Natural and Working Lands Action Plan](#)

# Strategies to Enhance the Contribution of NWLs to Climate Action

## 6. Implement NWL Climate Action Strategies

### Key Components of an Implementation Strategy include:

- 1 Engage and collaborate with key stakeholders** to facilitate widespread engagement and participation in identifying and implementing sustainable and equitable NWL pathways (policies, practices, and programs) (see slides [42-44](#) for additional information).
  - Including individuals and groups that were integral to Strategies 1-5 (such as those that examined land use in a state, conducted cost-benefit analysis, etc.) will be essential to developing an effective implementation strategy.
- 2 Establish a timeline with short- and long-term priorities and action**
  - Depending on the time frame, the strategies a state pursues in support of a goal/target will vary. For example, in North Carolina, stakeholders (see [Figure 21](#)) determined that the recommendations that should be considered to advance NWL climate action in the state should be categorized as near- or long-term opportunities ([North Carolina's Natural and Working Lands Action Plan](#)). New Jersey's, forthcoming Natural and Working Lands Strategy (NWLS) will similarly, "identify and prioritize near-term recommendations that are most immediately cost-effective and pragmatic...as well as longer-term goals that may require more detailed planning, identification of funding sources, or policy and social changes" ([2021 Natural and Working Lands Scoping Document](#)).
- 3 Track, evaluate, and share progress** (see slides [53-58](#)).

# Strategies to Enhance the Contribution of NWLs to Climate Action

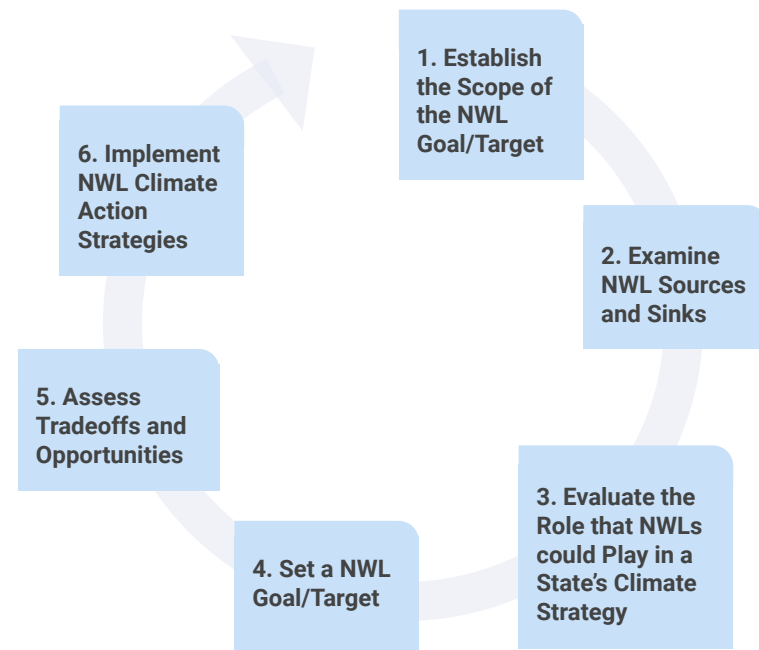
## Part 4, Section 2–Key Takeaways

NWLs are not a guaranteed carbon sink. Setting strategic near- and long-term priorities can help states 1) maximize the carbon sequestration and storage potential of NWLs and 2) reduce emissions from NWLs.

Increasing carbon sequestration *and* reducing GHG emissions from natural and working lands is a critical component of state and national deep decarbonization strategies.

To effectively enhance the contribution of NWLs to state and national climate goals, states should assess the role of NWLs in addressing climate change *and* the sector's social and cultural, environmental, and economic benefits.

A NWL GHG inventory, pathways analysis, and cost-benefit analysis are three tools that can help states evaluate the potential contribution of NWLs to state and national climate goals and the implications of various NWL climate action strategies.



# 5. NWL Climate Action: Implementation Case Studies

[Section Objective and Overview](#)

[Forests and Woodlands](#)

[Urban Green Spaces](#)

[Grasslands and Shrublands](#)

[Croplands and Rangelands](#)

[Wetlands](#)

[Key Takeaways](#)

# NWL Climate Action: Implementation Case Studies

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## Section Objective and Overview



### Section Objective:

- Share case studies that highlight specific pathways (policies, practices, and programs) states have taken to enhance the contribution of NWLs to climate goals/targets



### Section Overview:

- This section offers examples of pathways (policies, practices, and programs) that states are implementing to enhance the contribution of NWLs to climate goals, as well as to social and cultural, environmental, and economic well-being. The case studies in this section are from 2015–present and are organized by the following categories:
  - 1 State Policy/Program
  - 2 Innovative Funding/Financing (federal, state, and/or private)
  - 3 Diverse Partnerships (e.g., state, NGO, and higher education institutions)





# NWL Climate Action: Implementation Case Studies

## Forests and Woodlands

### Background

- Forests and woodlands cover over a third of the United States—823 million acres ([USDA](#)). These areas are immensely diverse across the Alliance, including tropical forests in Hawai'i, pinyon/juniper woodlands in New Mexico, and oak/hickory forests in Rhode Island.
- Forests provide countless social and cultural, environmental, and economic benefits:
  - Spending time in nature, including forests, supports mental health ([Akers et al., 2012](#), [Barton and Pretty, 2010](#), and [Berman et al., 2008](#)).
  - "National forests and grasslands are the largest source of freshwater in the US" ([USDA](#)).
  - Forests help support the outdoor recreation economy, a \$646 billion a year industry that employs 6.1 million Americans ([Outdoor Industry Association](#)).
- Forests also play a vital role in enhancing the contribution of NWLs to state and national climate goals: forests, urban trees and harvested wood products together provide the greatest amount of carbon sequestration nationally ([EPA, 2019](#)). However, "due to land disturbance, historic forest practices, and increased wildfire, forests have become a source of carbon emissions even exceeding their potential for sequestration" ([Marcus, 2022](#)). States across the Alliance are employing various land management strategies to support healthy and resilient forests, including to mitigate wildfire risks, address pests and disease, and enhance carbon sequestration and storage.
- Over half of the forest and woodland area in the United States is privately owned ([USDA](#)). Diverse land ownership and management of forestlands across Alliance states has implications for the feasibility of implementing pathways (policies and practices) to enhance the contribution of forests and woodlands to state climate goals.



# NWL Climate Action: Implementation Case Studies

Diverse Partnerships

Innovative Funding/Financing

State Policy/Program

## Forests and Woodlands

### Case Study: Investing in Forest Management to Prevent Wildfires in California—SB 332 and SB 926

In October 2020, Governor Newsom signed [Executive Order N-82-20](#), "a comprehensive and results-oriented nature-based solutions agenda" ([Natural and Working Lands Climate Smart Strategy](#)). The EO directs multiple state agencies to "identify and implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience," including on forests.

Climate-smart forest management "reduces the threat of catastrophic wildfire and supports long-term carbon storage" ([Natural and Working Lands Climate Smart Strategy](#)). In California, where forests are shifting from a carbon sink to a carbon source, climate-smart forest management is integral to achieving the goals of EO N-82-20. Although "fire is a natural and critical ecological function for maintaining healthy and resilient forests" ([California Air Resources Board](#)), due to a combination of factors, including the impacts of climate change, wildfires across the Western United States have become increasingly catastrophic in recent years. In 2020, California experienced the state's largest recorded wildfire, which emitted an estimated 112 MMTCO<sub>2</sub>. [Prescribed fire](#)—the intentional and controlled use of fire to meet a myriad of management objectives—is one climate-smart practice that can help mitigate the likelihood of a catastrophic wildfire.

In recognition of the important role of prescribed fire in mitigating the likelihood of catastrophic wildfires, in October 2021, [SB 332](#) became law. SB 332 "protects landowners and prescribed fire managers from having to pay fire suppression expenses unless they have acted with gross negligence" ([Senator Bill Dodd](#)). More recently, in August 2022, [SB 926](#), a follow-up to Senate Bill 332, became law. The legislation creates a \$20 million fund to help cover the costs associated with prescribed fire, thus helping to support the use of prescribed fire as a more commonplace practice to mitigate the likelihood of catastrophic wildfires.

# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Forests and Woodlands

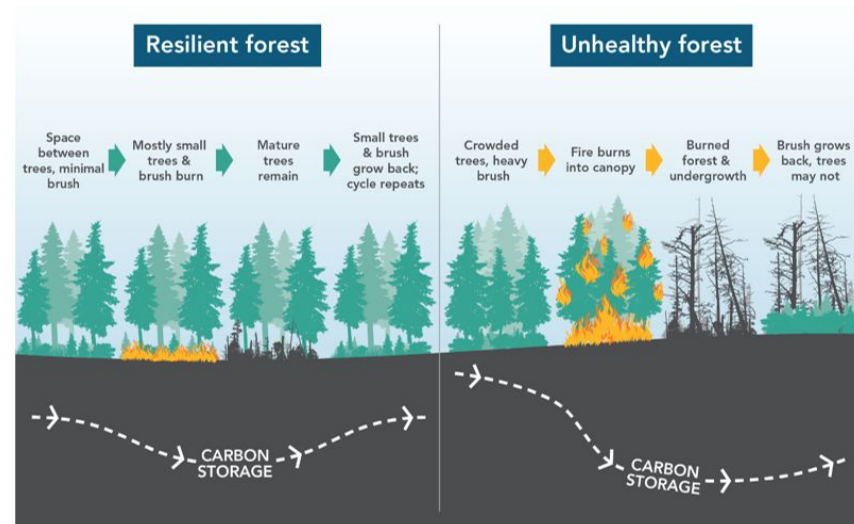
### Case Study: Investing in Forest Management to Prevent Wildfires in California—SB 332 and SB 926 (continued)

#### Keys to Success:

- ❑ **Evaluate tradeoffs to avoid unintended consequences.** Recognizing the increased risk that overstocked forests can pose for catastrophic wildfires, California's goal is not always to achieve "maximum carbon sequestration in natural and working lands," but rather to support resilient and healthy landscapes across the state ([California Air Resources Board](#)).
- ❑ **Examine a diverse landscape of benefits.** Investing in climate-smart forest management strategies will not only reduce the likelihood of catastrophic wildfires, but also protect water quality ([Ball et al., 2021](#)), livelihoods, and rural economies.
- ❑ **Collaborate with partners.** SB 926 was sponsored by The Nature Conservancy.

#### Resources:

- [California Natural and Working Lands Climate Smart Strategy, 2022](#)
- [Wildland Fire, USDA](#)

Source: [California Air Resources Board](#)



# NWL Climate Action: Implementation Case Studies

Diverse  
PartnershipsInnovative  
Funding/Financing

## Forests and Woodlands

### Case Study: Forest Restoration in the Pu'uwa'awa'a Forest Reserve and the Pu'u'anahulu Game Management Area in Hawai'i

Hawai'i's NWLs are critical to the well-being of the state's communities and ecosystems, but they are threatened by invasive species, climate change, and development. For the past decade, the Hawai'i Department of Land and Natural Resources and the Hawai'i Division of Forestry have been working to eradicate invasives, restore native forest, and maintain fire breaks in the Pu'uwa'awa'a Forest Reserve and the Pu'u'anahulu Game Management Area, both of which are located entirely on state land. Hawai'i received a Landscape Scale Restoration (LSR) grant to build fencing around a new unit of land in this area to manage invasives, improve forest health through restoration, and collect native seeds to support future restoration. This project helps to support Hawai'i's pledge to plant 100 million trees by 2030 and the state's 30X30 Watershed Initiative to protect 30 percent of priority native watershed forests by 2030.

Prior to receiving funds from a LSR grant, other projects in this area had received funding from several sources including a Department of Defense Readiness and Environmental Protection Integration Program (REPI) grant. The funds for this grant were used to meet the match requirement for the LSR grant.



Source: [Nāpu'u Conservation Project](#)



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

Innovative  
Funding/Financing

## Forests and Woodlands

### Case Study: Forest Restoration in the Pu'uwa'awa'a Forest Reserve and the Pu'uana'hulu Game Management Area in Hawai'i (continued)

#### Keys to Success:

- ❑ **Strong partnerships are key to success.** Before the LSR-funded project, the Napu'u game reserve already had a strong coalition of partners supporting restoration projects that made it easy to apply for partnership based LSR funding. This project has strong support from community volunteers, which provides a workforce to do the on-the-ground restoration work and maintenance.
- ❑ **Goals need to be ambitious but realistic.** Restoration is challenging and applications to federal programs need to reflect applicants' awareness that projects do not always go as planned. Projects should be ambitious, but applications should note contingencies and workarounds to ensure that the project can be successful even in the face of unforeseen circumstances.
- ❑ **Well-formulated state NWL goals can help projects succeed.** Hawai'i has a robust state Forest Action Plan, so it was straightforward to tie the LSR project into the Action Plan to help the state meet its goals. Hawai'i's state forester at the time was also involved in the planning and execution of this project and ensured that it was in alignment with state-wide goals and needs.

#### Resources:

- [Landscape Scale Restoration, US Forest Service](#)
- [Nāpu'u Conservation Project](#)



# NWL Climate Action: Implementation Case Studies

Innovative  
Funding/Financing

## Forests and Woodlands

### Case Study: Climate Action and Reforestation in Michigan—Regional Conservation Partnership Program Alternative Funding Arrangement

Michigan's 20 million acres of forests play a key role in protecting water quality in the Great Lakes, mitigating climate change, and supporting livelihoods and habitat. In 2020, Michigan applied for a Regional Conservation Partnership Program grant using an Alternative Funding Arrangement (RCPP AFA) to fund reforestation and afforestation on natural and working forest land over 4.5 million acres in Northern Michigan.

The project will provide greater flexibility and efficiency than the traditional Environmental Quality Incentives Program (EQIP) and will streamline the reforestation process and increase the scale of reforestation. Landowners will be provided with financial and technical assistance for site preparation and planting and for creating long-term plans for climate-smart forest management. This project will also help the state to move towards its net GHG reduction goals and take action aligned with its Forest Action Plan.

### Keys to Success:

- ❑ **Consult Natural Resources Conservation Service (NRCS) coordinators early and often.** Each state has an RCPP coordinator who can answer questions and help applicants tailor their project structure to NRCS requirements. This can help to streamline contract negotiation after project selection.
- ❑ **Plan for nursery capacity.** Michigan's nurseries will need advance notice to begin to grow trees to meet the need for seedlings on 4.5 million acres. Planning ahead to build nursery and workforce capacity can help ensure that projects meet their timelines.

### Resource:

- [MSU Forest Carbon and Climate Program plays active role in \\$5.3M grant for climate action and reforestation - Department of Forestry](#)

# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Forests and Woodlands

### **Ambitious Policies to Reduce Wildfire Risk, Increase the Reforestation Pipeline, and Support Communities—Colorado's 2022 Legislative Session**

During Colorado's 2022 legislative session, a historic suite of policies were passed to support forest and community health in Colorado:

1. [HB22-1011](#): Wildfire Mitigation Incentives for Local Governments
2. [HB22-1007](#): Assistance Landowner Wildfire Mitigation
3. [HB22-1379](#): Wildfire Prevention Watershed Restoration Funding
4. [HB22-1323](#): Updates to State Forest Service Tree Nursery
5. [HB22-1012](#): Wildfire Mitigation and Recovery
6. [SB22-007](#): Increase Wildfire Risk Mitigation Outreach Efforts
7. [SB22-206](#): Disaster Preparedness and Recovery Resources

#### **Keys to Success:**

- ❑ **A suite of connected legislation can support climate action across a sector.**



Source: Colorado Parks and Wildlife



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Forests and Woodlands

### Case Study: Engaging Private Landowners in Post-Fire Restoration Efforts in New Mexico

Private landowners own almost half of forested lands in New Mexico ([Goeking and Menlove 2017](#)). Recognizing the importance of private landowners in building healthy forests across the state, one of the key strategies in the state's [2020 Forest Action Plan](#) is to support private land stewardship through government agencies and non-governmental organizations (NGOs).

The 2022 Calf Canyon/Hermits Peak Fire is New Mexico's largest recorded wildfire. Located in the southern Sangre de Cristo Mountains in San Miguel County, Mora County, and Taos County, the wildfire burned across 340,000 acres. In the aftermath of the Calf Canyon/Hermits Peak Fire, landowners are facing widespread [erosion and flooding](#). There are many challenges to supporting private landowners after a wildfire, including a lack of funding from state and federal agencies. In addition, it is often challenging for landowners to determine how and where to seek help to restore forested lands impacted by wildfire.

[New Mexico State Forestry](#) (NMSF) played a vital role in supporting post-fire restoration on private lands impacted by the Calf Canyon/Hermits Peak Fire. NMSF coordinated with the Emergency Forest Restoration Program (EFRP) for the first time in New Mexico's history. EFRP helps owners of non-industrial private forests restore forests damaged by natural disasters by authorizing much-needed payments to landowners for restoration. EFRP is administered by the Farm Service Agency (FSA) and NMSF is providing the technical assistance for the program.

To provide much-needed, on-the-ground support for landowners impacted by the Calf Canyon/Hermits Peak Fire, NMSF was involved in a collaboration between the [New Mexico Forest and Watershed Restoration Institute \(NMFWR\)](#) and [Luna Community College](#) to host free workshops, "[Querencia in Action: Post-Fire Land Restoration](#)." The goals of the workshops were to help landowners learn how to restore burned lands, reduce erosion, and regenerate forests. The Forestry Division worked with NMFWR to 1) identify landowners to host the workshops, 2) coordinate with staff to identify individuals that could help with the assessment phase of the program, and 3) explore funding sources that would support the implementation of post-fire restoration practices.



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Forests and Woodlands

### Case Study: Engaging Private Landowners in Post-Fire Restoration Efforts in New Mexico (continued)

“These workshops are intended to provide some basic training to individuals who may have lost their ability to make a living off the land because of the recent wildfires and give them skills that will enable them to seek employment restoring the fire impacted areas. The hope is that individuals who participate in the training will possess the skills needed to be hired to do some of this work by contractors or landowners. In addition, these workshops will also benefit landowners who can utilize what they learn to restore their own property.”

Dr. Edward Martinez, President of Luna Community College in [The Las Vegas Optic](#)



Source: Jacob Robinson, NMFWR



Source: Kathryn Mahan, NMFWR



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Forests and Woodlands

### Case Study: Engaging Private Landowners in Post-Fire Restoration Efforts in New Mexico (continued)

#### Keys to Success:

- ❑ **Develop collaborations** to support restoration on private lands.
- ❑ **Invest in workforce development and job training** to empower individuals and build wildfire resilience and recovery.
- ❑ **Host free, in-person learning opportunities** to encourage public participation in restoration.



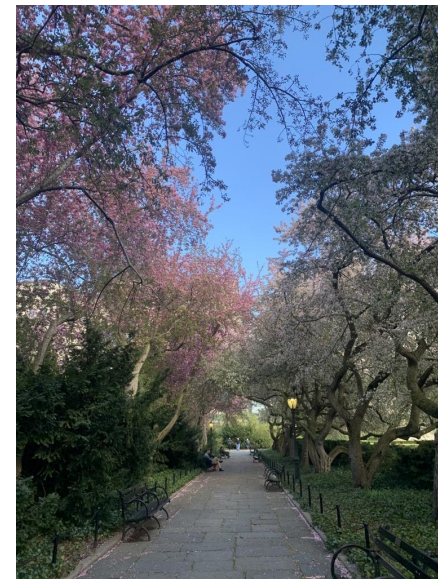
Source: Kathryn Mahan, NMFWR

# NWL Climate Action: Implementation Case Studies

## Urban Green Spaces

### Background

- Urban Green Spaces (UGS) refer to urban areas that are covered with grass, trees, shrubs, or other vegetation ([Haas et al., 2021](#)). Examples of UGS include parks, rooftop gardens, and urban forests.
- UGS provide areas for recreation, health and economic benefits, and social cohesion ([Hartig et al., 2014](#), [Hunter et al., 2019](#), [Kuo 2003](#)). For example, urban forests in the coterminous United States have an estimated structural asset value of \$2.4 trillion, not including other ecosystem service benefits ([Nowak et al., 2002](#)). UGS also provide critical ecological benefits, including by helping manage stormwater runoff, providing critical habitat in urban spaces, and storing carbon—urban trees store approximately 700 million tonnes of carbon ([Nowak and Crane 2002](#)).
- Given the many benefits of UGS, many Alliance states have plans and/or targets for bolstering UGS:
  - **Michigan** pledged to plant [50,000 trees in developed areas](#).
  - **Maryland** committed to planting and helping maintain five million additional native trees by 2031, at least [10 percent](#) of which must be planted in underserved urban areas.
  - **Hawai'i** pledged to "[conserve, restore, and grow 100 million trees](#)" by 2030, including by planting trees in urban areas.



Central Park, New York  
Source: USCA



# NWL Climate Action: Implementation Case Studies

Diverse  
PartnershipsInnovative  
Funding/Financing

## Urban Green Spaces

### Case Study: Creating Tree Equity in Detroit, Michigan

Over 70 percent of the United States' population lives in urbanized areas with at least 50,000 residents ([American Forests](#)). Urban forests provide key health, economic, and climate benefits to this vast population. However, trees are not evenly dispersed in cities across the United States due to a history of exclusionary policies, including redlining.

**Michigan's goal is to ensure all urban communities have over 40 percent tree canopy cover** ([Forest Action Plan 2020](#)). Diverse partnerships in the state are helping to realize this goal. For example, in 2016, [American Forests](#), the [City of Detroit](#), and [The Greening of Detroit](#) launched the Detroit Tree Equity Partnership (DTEP), a public-private effort to address urban tree inequities and enhance the city's urban green spaces.

#### The Partnership's priorities include:

- Improve social, public health and environmental outcomes by restoring Detroit's tree canopy – at-scale, citywide,
- Attract new investment into Detroit from non-traditional sources and investors, and
- Increase employment and business ownerships opportunities for Detroit residents.



Images courtesy of American Forests



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

Innovative  
Funding/Financing

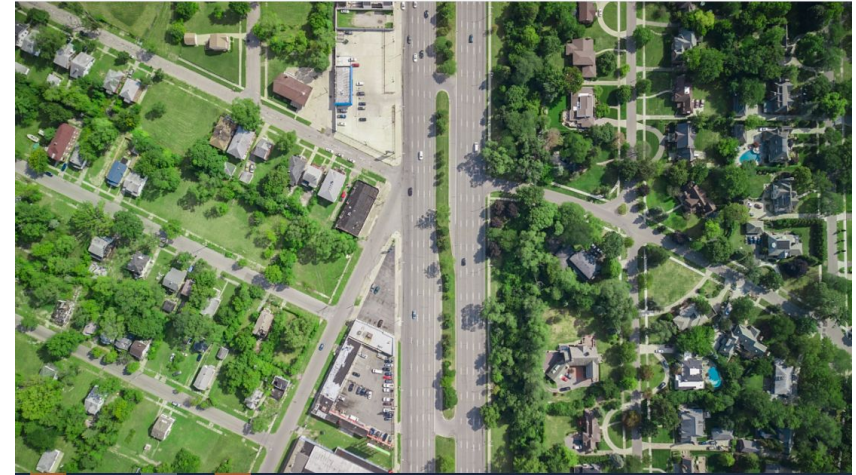
## Urban Green Spaces

### Case Study: Creating Tree Equity in Detroit, Michigan (continued)

The Detroit Tree Equity Partnership's (DTEP) efforts will help the City of Detroit achieve [Tree Equity](#)—where there are "enough trees in a neighborhood for everyone to experience the health, economic, and climate benefits that trees provide" ([American Forests](#)).

DTEP is currently implementing its five-year pilot plan to:

- Plant 75,000 trees throughout Detroit,
- Train and place 318 Detroit residents into jobs, and
- Attract more than \$30 million in new investment.



Opposite sides of Woodward Avenue in Detroit  
Source: [Johnny Miller](#)

# NWL Climate Action: Implementation Case Studies

Diverse Partnerships

Innovative Funding/Financing

## Urban Green Spaces

### Case Study: Creating Tree Equity in Detroit, Michigan (continued)

#### Keys to Success:

- ❑ **Partnerships maximize capacity.** The scale of urban forestry challenges are beyond the capacity of any one entity acting alone. The DTEP coalition has clarified priorities and focused effort in a way that allows multiple partners to contribute to the solution and has attracted non-traditional partners who are contributing additional expertise, funding, and resources.
- ❑ **Rigorous research enhances impact.** The Tree Equity methodology and additional, robust research connects DTEP's work to important public policy outcomes and urban forestry best practices.
- ❑ **Innovative financing can enable ambitious projects.** New and substantial sources of funding can be utilized by connecting the public health, economic and environmental benefits trees and urban green spaces provide to important public policy priorities, thus facilitating the work at a scale that approximates the need.

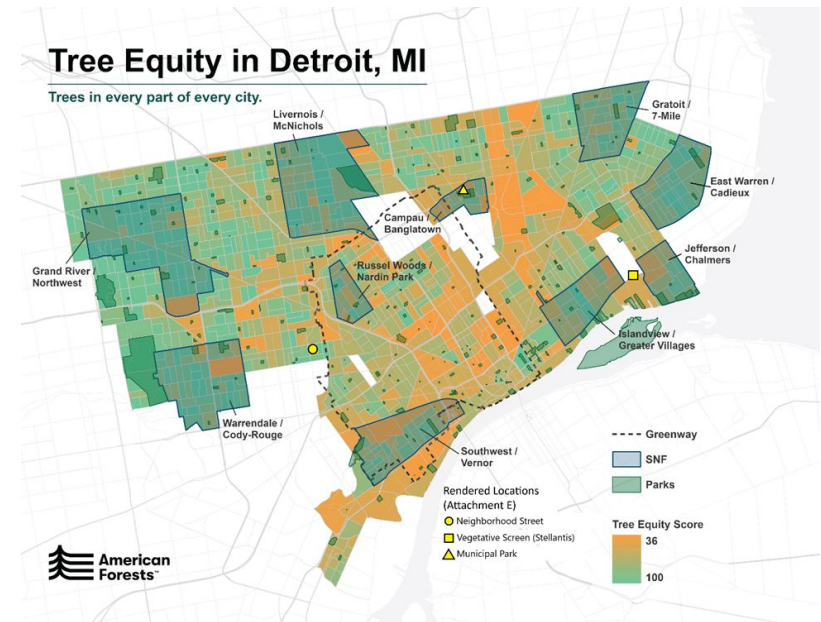


Figure 22: Map of existing tree equity conditions in Detroit  
 Courtesy of American Forests



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Urban Green Spaces

### Case Study: Building Public-Private Partnerships to Fortify Urban Green Spaces in Pennsylvania

Supporting urban and community forestry are key priorities in Pennsylvania ([Forest Action Plan 2020](#)). To fortify urban green spaces in the state, the Department of Conservation and Natural Resources (DCNR) established TreeVitalize, a public-private partnership to help build capacity within communities to plan for, plant, and care for trees, and to offer educational trainings to help citizens understand the diverse benefits of trees and the importance of properly planting and maintaining them.

The program offers technical assistance to communities to conduct street tree inventories, young tree monitoring, and general urban forest management. TreeVitalize also provides grants to municipalities and non-profits to establish and build programs that plant and maintain public shade trees. The program has awarded nearly \$6 million in grants and planted more than 400,000 trees since its inception.

### Keys to Success:

- ❑ **Develop public-private partnerships** to help extend and maximize the impact of programs across a state.
- ❑ **Provide public trainings** to educate and empower citizens to care for urban green spaces.
- ❑ **Track, evaluate, and share progress.** TreeVitalize's [Open Tree Map Tool](#) publicly communicates the number of trees planted through the program and the associated benefits, including: energy conserved, stormwater filtered, air quality improved, carbon dioxide removed, and carbon dioxide stored.



Images courtesy of TreeVitalize



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Urban Green Spaces

### Case Study: Building Climate Resilience in Rhode Island through Stakeholder Engagement and Equity-Based Urban Tree Planting

Rhode Island seeks to "recognize the values and contributions of our urban forests and assure coordination and collaboration with this community to realize their full complement of benefits" ([2020 Forest Action Plan](#)). Across the state, collaborations and efforts by a multitude of public and private actors are helping to realize this important goal.

Groundwork Rhode Island (GWRI) is a non-profit, community-based organization that primarily serves three communities in Rhode Island: Providence, Pawtucket, and Central Falls. In 2018, GWRI was selected to join the [Climate Safe Neighborhoods](#) (CSN) partnership, "a program designed to explore the relationship between historical race-based housing segregation and the current and predicted impacts of climate change" ([GWRI](#)). GWRI's goal in the program was to better understand the driving causes of extreme heat and flooding through stakeholder engagement and the use of publicly-available data to tell a compelling story.



Images courtesy of [Groundwork Rhode Island](#)





# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Urban Green Spaces

### Case Study: Building Climate Resilience in Rhode Island through Stakeholder Engagement and Equity-Based Urban Tree Planting (continued)

GWRI identified short- and long-term actions to address the root causes of extreme heat and flooding in communities, as well as build communities' resilience to climate change:

- **Short-term actions** included conducting a survey of neighborhood residents to understand the community's goals and concerns related to climate change, educating GWRI's high school youth Green Team regarding extreme heat and other climate change impacts, conducting outreach for a demonstration green infrastructure project to install rain barrels and raised garden beds at residents' homes in areas most prone to flooding and extreme heat, collaborating with the Arbor Day Foundation and other partners to plant trees, and assessing the effectiveness and reach of existing municipal tree planting programs.
- To fortify the **long-term well-being and resilience** of Rhode Island's urban communities, GWRI worked on three systemic issues: 1) demonstrating how transitioning from a first-come, first-serve tree planting model to an equity-based program - where priority goes to areas with less tree canopy - would yield the most benefits for urban communities, 2) strengthening the tree planting outreach, engagement, and application processes to reach a wider cross-section of residents with a particular emphasis on less affluent areas and areas with more people of color, and 3) ensuring that non-English speakers were able to benefit from tree planting programs.



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Urban Green Spaces

### Case Study: Building Climate Resilience in Rhode Island through Stakeholder Engagement and Equity-Based Urban Tree Planting (continued)

#### Keys to Success:

- ❑ **Engage with stakeholders to identify priority areas of intervention.** GWRI organized an outreach campaign to learn how residents were experiencing the impacts of climate change. Listening to community members, engaging a variety of partners, and utilizing informal social networks were a key component of GWRI's research and informed both short-and long-term strategies.
- ❑ **Develop and execute short- and long-term actions.** Addressing inequities and building community and state resilience to the impacts of climate change takes time and requires creative thinking. Smaller wins and tangible results at the beginning help build interest and enthusiasm for longer-term solutions and future investments.
- ❑ **Storytelling can help engage and educate communities.** GWRI used publicly-available data including a variety of mapping tools developed by key partners to communicate with community members and other stakeholders, including City leadership, regarding the root causes of disparities in tree equity and the impacts felt today. This data helped tell a compelling story that encouraged residents to engage with tree planting and start to connect their own individual stories with collective concerns.



# NWL Climate Action: Implementation Case Studies

## Grasslands and Shrublands

### Background

- **Grasslands** are lands that are primarily covered with grasses and herbaceous vegetation and less than 10 percent tree cover and have fertile organic soils ([CA Natural and Working Lands Climate Smart Strategy](#)). **Shrublands** are defined by low, woody plants that cover more than 10 percent of the land and are often found in semi-arid or post-fire environments or environments with a short growing season ([US Forest Service, 2007](#)). Many grasslands and shrublands are used as rangelands or are cleared for other agricultural or development use, which can threaten the unique ecosystems they support and release stored soil carbon.
- Grasslands once covered 1 billion acres in the US, but much of this land has been lost, largely due to population growth and development ([Texas A&M](#)). Restoring grasslands such as prairie ecosystems by reintroducing long-rooted perennial species, restoring historic fire regimes, and restoring beneficial grazing practices can increase soil carbon stocks and soil health and provide critical wildlife habitat ([US Forest Service Climate Change Resource Center](#)). Native grasses have deep root structures that increase organic matter in soils and re-establishment of these plants can increase soil carbon stocks over long timescales (decades to centuries) ([Yang et al., 2019](#)).
  - Globally, grassland restoration could eventually sequester 3 Gt CO<sub>2</sub>e per year ([Lal 2009](#)).
- Shrublands in the US include diverse ecosystems that range from sagebrush ecosystems to dry chaparral. Many native shrubland ecosystems have become fragmented and degraded by agriculture and altered fire regimes and intervention can help to restore native plant communities and wildlife. However, in some areas, shrublands dominated by non-native species have expanded to replace forests after severe wildfires or drought ([UC Davis](#)). Post-fire reforestation with climate-resilient species can help to prevent forest land from transitioning to shrubland.



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

## Grasslands and Shrublands

### Case Study: Nachusa Grasslands Restoration in Illinois

The Illinois Wildlife Action Plan sets a goal of protecting and restoring one million acres of grassland and working with NRCS to designate areas as State Acres for Wildlife Enhancement (SAFE) through the CRP program. One area identified for the SAFE program is the Nachusa Grasslands Preserve. Since 1986, a devoted group of staff and volunteers has been working at the Nachusa Grasslands preserve to protect and restore the prairie and woodlands ecosystem native to northern Illinois, re-establish historic fire regimes, and increase native species. The Nature Conservancy now owns the core of the preserve, and 3,500 acres have been protected through acquisition or easements. The large scale of this protected prairie makes it large enough to host a herd of native bison, which were reintroduced in 2014.

### Keys to Success

- ❑ **Long-term monitoring produces key data:** Stewards of Nachusa Grasslands have conducted detailed transect surveys to monitor restoration progress since 1986, giving current land managers valuable insight into trends over time.
- ❑ **Committed local stewards provide a workforce and financial support.** Friends of Nachusa Grasslands has provided a volunteer workforce and builds endowments to support the ongoing stewardship.

### Resources:

- [Friends of Nachusa Grasslands](#)
- [Twenty Years of Prairie Restoration](#)
- [Nachusa Grasslands | The Nature Conservancy in Illinois](#)



# NWL Climate Action: Implementation Case Studies

## Croplands and Rangelands

### Background

- Croplands and rangelands cover 366.7 million acres and 404.4 million acres respectively in the United States ([USDA, 2018](#)).
- Alliance states make up a diverse and significant part of US agricultural production, including five of the top 10 agricultural states (cash receipts), the top three US milk states (production), and five of the top six US fruit states (production) ([USDA NASS, 2017](#)). California alone accounts for 48 percent of all fresh vegetable production in the US ([USDA NASS, 2017](#)).
- Climate change is impacting agricultural production, including through more frequent environmental shocks (floods, droughts, fires, record high temperatures, and unusual weather patterns). For example, in 2011, exposure to high temperature events caused over \$1 billion in heat-related losses to agricultural producers ([US Global Change Research Program, 2014](#)).
- Croplands and rangelands can play an important role in state climate strategies—both by reducing emissions and increasing carbon sequestration and storage. Various climate-smart practices such as no-till, cover cropping, and agroforestry can increase carbon sequestration, improve soil health, and reduce nutrient runoff. These practices also have economic benefits for farmers and helps them adapt to climate change. However, implementing [climate-smart practices](#) can be challenging, requiring technical assistance, financial support, and additional research. Some Alliance states (California, Maryland, and Vermont, among others) are working to better integrate croplands and rangelands into state NWL GHG inventories. Additional support from the federal government and non-governmental partners is needed to enable Alliance states to better track and evaluate the contribution of climate-smart practices to state climate goals/targets.
- In addition to carbon dioxide (CO<sub>2</sub>), agriculture releases other potent greenhouse gases—Methane (CH<sub>4</sub>) (45X CO<sub>2</sub>), primarily from livestock management, and Nitrous Oxide (N<sub>2</sub>O) (298X CO<sub>2</sub>), primarily from synthetic nitrogen fertilizer. States should pursue strategies that not only increase the carbon sequestration and storage of croplands and rangelands, but also reduce GHG emissions attributed with practices on these land types.



# NWL Climate Action: Implementation Case Studies

Diverse  
PartnershipsInnovative  
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Policy/Program

## Croplands and Rangelands



### Case Study: Improving Soil Health through a Decade of Programs and Partnerships in Minnesota

For over a decade, Minnesota has been developing innovative programs and partnerships to improve soil health in the state. Various agencies, departments, academic institutions, and non-government entities have worked together to pursue diverse pathways (policies and programs) to bolster soil health across Minnesota.

**2013:** The **Local Government Water Roundtable** (conservation districts, watershed districts, and counties) recommended that watershed planning be conducted at a major watershed scale, rather than at a county (jurisdictional) scale.

**2015:** The Minnesota Legislature established [One Watershed, One Plan](#) (1W1P), a voluntary program that aims to facilitate and enhance collaboration between upstream and downstream regions through watershed-wide partnerships. To date, 28 comprehensive watershed plans have been approved and over 90 percent of Minnesota's 81 major watersheds are participating in the program. Many watershed management plans include soil health practices in their planning efforts and goals.

**2015:** The Minnesota Department of Agriculture launched the [Minnesota Agricultural Water Quality Certification Program](#) (MAWQCP), a voluntary certification program that provides participants with regulatory certainty, recognition, and priority for technical and financial assistance. Certified producers can receive endorsements for climate-smart practices and soil health. As of September 2022, the program has certified over 1,200 farms, which have implemented conservation practices that have reduced 49,103 tonnes CO<sub>2</sub>e annually (to learn more about other environmental benefits of the program see [MDA's 2021 Water Quality Certification Program Legislative Report](#)). To learn more about certified producers, visit the [MAWQCP Story Map](#).



**2015:** "Soil health" is defined in Minnesota as "the continued capacity of soil to function as a vital living system that sustains plants, animals, and humans. Indicators of soil health include water filtration capacity; organic matter content; water holding capacity; biological capacity to break down plant residue and other substances and to maintain soil aggregation; nutrient sequestration and cycling capacity; carbon sequestration; and soil resistance" ([Minn. Stat. 103C.101, Subd. 10a](#)).



# NWL Climate Action: Implementation Case Studies

Diverse  
Partnerships

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## Croplands and Rangelands

### Case Study: Improving Soil Health through a Decade of Programs and Partnerships in Minnesota (continued)

**2017:** The [Minnesota Office for Soil Health](#) (MOSH) was established as a collaboration between the Minnesota Board of Water and Soil Resources (BWSR) and the University of Minnesota Water Resources Center. Its mission is to protect and improve soil resources and water quality by developing the knowledge, skills and abilities of local experts to more effectively promote sustainable soil and land management.

**2018:** MOSH was awarded a [Conservation Innovation Grant](#) (CIG) to research on-farm soil health on over 15 farms and to develop guidance on interpreting soil health measurements in the state. Researchers are collecting, analyzing, and sharing on-farm soil health data to help farmers and others interpret and use soil health measurements. Guidance for interpreting soil health measurements in Minnesota will be available by end of 2022.

**2021:** BWSR received funding from the Minnesota Legislature through the [Clean Water Fund](#) to establish a [Soil Health Grant](#) to farmers via local governments to enhance the adoption of cover crops and other soil health practices in areas where there are direct benefits to public water supplies. \$3.5 M was made available in 2022.

**2022:** BWSR receives philanthropic support to develop a soil health action plan, in collaboration with MOSH, *“To accelerate adoption of soil health practices and principles by convening a mix of practitioners and experts in agriculture and conservation fields to collaboratively set goals and strategies, for a unified approach to climate change mitigation and landscape resiliency.”*

**2022:** The Soil Health Financial Assistance Pilot Program is established by the Legislature ([Laws 2022, art.2, s. 29](#)). MDA is directed to develop a Healthy Soil Management Plan in consultation with the University of Minnesota, the USDA Natural Resources Conservation Service, the BWSR, the Minnesota Pollution Control Agency, and nongovernmental environmental and agricultural organizations and 2) establishes a grant program to support climate-smart practices on agricultural lands.



# NWL Climate Action: Implementation Case Studies

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## Croplands and Rangelands

### Case Study: Improving Soil Health through a Decade of Programs and Partnerships in Minnesota (continued)

**2022:** BWSR, MDA and other partners co-host “**Dig-It: The Secrets of Soil**” (based on a Smithsonian National Museum of Natural History exhibit) at the Minnesota State Fair. Minnesota-specific panels include information about the state’s soil types, conservation practices that promote soil health, and the relationship between soils and climate change. (See “[Snapshots](#)” story for details.) Interactive displays enabled visitors to get their hands dirty.

#### Keys to Success:

- ❑ **Collaborate across departments, agencies, academic institutions, and non-governmental organizations** to leverage existing research, partnerships, and programs to maximize the benefits of soil health.
- ❑ **Build on the connections between water quality and soil health.** Minnesota’s watershed approach and Clean Water Fund support soil health practices that protect public water supplies, reduce soil erosion, and build resilience to extreme precipitation while also helping farmers adapt to and mitigate climate change.
- ❑ **Storytelling and public outreach** can help garner public interest and support for state efforts.
  - ❑ For example, the [MAWQCP Story Map](#) includes information about over 70 water quality certified producers in Minnesota.
  - ❑ Field days, pasture walks, and other in-person events are effective ways to connect with farmers.



Members of the public learn about soil health at the 2022 Minnesota State Fair  
Image courtesy of BWSR





# NWL Climate Action: Implementation Case Studies

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Policy/Program

## Croplands and Rangelands

### Case Study: Colorado's STAR Plus Soil Health Program

Protecting agricultural soils and increasing soil health is a key priority for Colorado. In 2020, Colorado passed its Healthy Soils Bill, which appropriated funding to pilot the Saving Tomorrow's Agricultural Resources (STAR) program. The STAR program was first implemented in Illinois and was adapted to fit Colorado producers' needs. The STAR program is a practice-based rating system that gives producers points for adopting soil health practices and allows them to market commodities using the STAR label. In 2022, Colorado initiated a pilot of the STAR Plus program, which builds upon the basic STAR program and distributes funds to conservation districts to provide incentive payments and technical support to producers in the STAR program. The state received a NRCS Conservation Innovation Grant (CIG) to enroll an additional 100 participants in the STAR Plus program, provide increased funding for conservation districts to administer the program, and to bring sociologists onto the project to better understand socioeconomic barriers to adoption of soil health practices.

### Keys to Success:

- ❑ **Leverage state investments as match and leverage philanthropic support.** Colorado used \$2 million of state COVID stimulus funding, which funds the Colorado Soil Health Program, as match for this CIG project and attracted philanthropic funding from the Gates Family Foundation to increase the impact of federal funding.
- ❑ **Working with on-the-ground experts is key.** Because conservation districts have built trust and relationships with farmers and ranchers, they are key partners for implementing soil health programming. Conservation districts received funding from the CIG grant to increase capacity and technical assistance provision.

### Resources:

- [Conservation Innovation Grants, USDA](#)
- [Colorado producers, conservation districts pursue soil health practices - Fruit Growers News](#)



# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Croplands and Rangelands

### Case Study: Building Soil Health in New Mexico through Education and Technical Assistance

In 2018, a coalition of multiple agriculture and conservation stakeholders formed a coalition called the [New Mexico Healthy Soil Working Group](#) with the goal of accelerating soil health stewardship in the state through increasing soil health education, technical support, and soil health financial incentives. The working group "brought together an extensive coalition of over 100 food and agriculture related organizations, as well as environmental groups and dozens of farms and ranches" ([New Mexico Healthy Soil Working Group](#)). This coalition provided significant input and feedback into drafting the [New Mexico Healthy Soil Act](#) which had bipartisan support in the house, received unanimous backing in the senate, and was signed into law by the governor on April 2, 2019." **The Working Group found that a large coalition of diverse stakeholders that focused on the benefits of healthy soils for communities and producers, rather than in terms of GHG, while emphasizing a voluntary approach, was vital in solidifying support for the bill.**

New Mexico's [Healthy Soil Program \(HSP\)](#) was created when the act was signed. The purpose of the HSP is "to promote and support farming and ranching systems and other forms of land management that increase soil organic matter, aggregate stability, microbiology, and water retention to improve the health, yield and profitability of the soils of the state." This purpose is achieved through grant-funded projects aimed at improving soil health. The NM Department of Agriculture oversees HSP execution – which includes both funding and educational outreach.

In the first year of the program (2019), demand far exceeded funding. There were 84 applications received for pilot project grants, requesting over \$1.37 million (out of \$175,000 available). A second request for proposals for soil health education and outreach projects drew 49 grant proposals with an additional \$938,000 in funding requests. Of these, 19 educational projects are being funded to the amount of \$186,000 as well as a train-the-trainers program run through Cooperative Extension. In 2020, recurring state funding to the HSP in the amount of \$227,000 has been secured, with a federal match of \$100,000.

# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Croplands and Rangelands

### Case Study: Building Soil Health in New Mexico through Education and Technical Assistance (continued)

#### Keys to Success:

- ❑ **Collaborating with diverse stakeholders can help garner support and advance action.** By working with over 100 organizations, the [New Mexico Healthy Soil Working Group](#) aggregated multiple perspectives and provided key input into drafting the [New Mexico Healthy Soil Act](#). Early and widespread engagement with various stakeholders also helped garner interest in the state's Healthy Soil Program (HSP)—in the first year of the program, demand far exceeded available funding.
- ❑ **Align climate action with the perspectives and values of stakeholders.** For example, the New Mexico Healthy Soil Working Group focused its efforts on the benefits of healthy soils for communities and producers, rather than the climate-specific (emissions reductions and increased carbons sequestration and storage) benefits of soil health.

#### Resource:

- [Soil Health Policy, Developing Community-Driven Soil Health Policy and Programs](#)





# NWL Climate Action: Implementation Case Studies

Innovative  
Funding/FinancingState  
Policy/Program

## Croplands and Rangelands

### Case Study: Supporting Maryland Maple Dell Farm Riparian Restoration with the State Water Quality Revolving Loan Fund

In order to manage stormwater runoff and erosion, Howard County, Maryland received a loan from Maryland's Water Quality Revolving Loan Fund. The Revolving Loan Fund provides loans to improve the quality of streams, rivers, and other state water resources and was strengthened with additional funding through the Bipartisan Infrastructure Law. With this loan, Howard County was able to partner with Maple Dell Farm to secure a perpetual agricultural conservation easement and restore 6,182 linear feet of stream on the farm, which had been degraded by cattle, and to plant trees on 14 acres, helping move the state closer to its goal of planting 5 million trees by 2031. The stream running through Maple Dell Farm is part of the Howard County Green Infrastructure Network Corridor, which provides a key link between watersheds and was a high priority for restoration. The project was also supported by grant funding from Maryland Department of Natural Resources and the Washington Suburban Sanitary Commission and generated 62 acres of impervious surface restoration credit for the county under Maryland Law.

### Keys to Success:

- ❑ **Leverage state legislation.** Maryland's Conservation Finance Act made green and blue infrastructure eligible for the same financial assistance as gray infrastructure, which allows the state revolving loan fund to be used for projects such as the restoration at Maple Dell Farm.

### Resource:

- [Maple Dell Farm Riparian Buffer and Stream Restoration - Chesapeake Conservation Landscaping Council](#)



# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Croplands and Rangelands

### **Case Study: Mitigating Climate Change by Protecting Farmland and Local Planning: California Sustainable Agricultural Lands Conservation Program (SALC)**

While agricultural land protection is not often recognized as a climate-friendly agricultural practice, a growing body of research demonstrates that protecting agricultural lands from development and promoting compact growth can be key components to comprehensive GHG reduction strategies. Agricultural lands can function as carbon sinks and conserving these lands, coupled with local land-use planning encourages inward and more compact development growth and prevents inefficient transportation and energy use from low-density residential development on farmland. Protecting farmland also keeps land available for flood and fire mitigation and keeps farmland more affordable for new farmers since it is no longer valued for its development potential.

All Alliance states have policies and programs intended to prevent conversion of agricultural land to other uses through permanent protections (e.g., easements), development restrictions (e.g., zoning, use-dependent taxation), minimizing conflicts between uses (e.g., right to farm laws), or compensating for conversion (e.g., farmland mitigation). These protection programs, coupled with local land-use planning, can result in more compact future growth, which in turn reduces future GHG emissions by reducing vehicle miles traveled and the intensity of energy use and protects the potential of sequestering carbon on those agricultural lands. Alliance states were among the first to adopt statewide programs including Maryland and Massachusetts in 1977 and Connecticut in 1978. Currently, most states and many local governments have farmland and/or rangeland protection programs. The state and local programs also are complemented by federal programs such as the [Agricultural Conservation Easement Program](#) (ACEP).

[SALC](#) is an example of a state program that recognizes this potential, providing grants for conservation easements and land-use planning and quantifying the avoided GHG emissions resulting from conservation of farmland. American Farmland Trust's 2018 "[Greener Fields](#)" study found that cutting California farmland loss by 75 percent by 2050 (700,000 acres) while encouraging compact urban growth would avoid GHG emissions by 33 tons of GHG (per acre per year). That is the equivalent of taking 1.9 million cars off the road each year. Practices and tools that support farmland protection are already in place for reasons other than climate benefits. These include conservation easements, tax incentives for landowners, and land-use policies and planning grants for local and regional entities.



# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Croplands and Rangelands

### Case Study: Mitigating Climate Change by Protecting Farmland and Local Planning: California Sustainable Agricultural Lands Conservation Program (SALC) (continued)

#### Keys to Success:

- ❑ **There are many pathways (policies and practices) that can be pursued to enhance climate action.** For example, although farmland protection is not often recognized as a climate-friendly agricultural practice, it is a strategy that can help fortify and enhance existing carbon sinks and significantly reduce future greenhouse gas emissions. Diverse tools and practices can be employed to support farmland protection, including conservation easements, tax incentives for landowners, and land-use policies and planning grants for local and regional entities. Farmland protection also has equity and justice benefits by making farmland prices more affordable and accessible for historically underserved groups.
- ❑ **Collaborating with other agencies and departments is integral to ambitious climate action.** Farmland protection efforts can be coupled with local land-use planning to spur more compact future growth, thus reducing vehicle miles traveled (VMT).



# NWL Climate Action: Implementation Case Studies

State  
Policy/Program

## Croplands and Rangelands

### Case Study: Encouraging Pollution Prevention Practices through the Michigan Agricultural Environmental Assessment Program (MAEAP)

The [Michigan Agricultural Environmental Assurance Program](#) (MAEAP) is a voluntary program that helps farms of all sizes in Michigan, across all commodity groups, prevent or minimize risks associated with agricultural pollution. The program aims to help farmers maintain economic viability while being environmentally responsible. Additionally, MAEAP ensures that Michigan farmers are engaging in cost-effective pollution prevention practices and are working to comply with state and federal environmental regulations.

MAEAP was codified into law with Senate Bill 122 and House Bill 4212, now Public Acts 1 and 2 of 2011. Motivation to do so came from stakeholders who wanted confidence that efforts made to meet verification requirements would be worthwhile in the long-term. As MAEAP has developed, the state has taken measures to ensure that the program aligns with all federal and state policies, and that it is in sync with corporate and national sustainability programs.

Environmental outcomes are estimated for farms verified in MAEAP. Since 2007, data from conservation practices implemented on farms participating in MAEAP have been collected by verifiers and technicians, who report back to MAEAP. In addition, the reduction of sediment, phosphorus, nitrogen, and Biochemical Oxygen Demand (BOD) (five-day) loadings have been estimated. Assessment tools included to calculate estimated loading reductions include the Revised Universal Soil Loss Equation (RUSLE), Wind Erosion Equation, Gully Erosion Equation, and the Pollutants Controlled Calculation. Each year, MAEAP collects the number, size, linear feet, and acres of installed best management practices (BMPs). The BMPs included are nutrient management plans, buffer/filter strips, cover crops, conservation tillage, no-till, grassed waterways, livestock exclusion fencing, silage pads, and pest management plans. Results are aggregated at the watershed scale to maintain participant confidentiality.

#### Keys to Success:

- ❑ **Tracking, evaluating, and sharing progress is essential.** Each year MAEAP collects information about BMPs implemented on farms across Michigan, providing vital information about the impacts of BMPs such as nutrient management plans and cover crops.

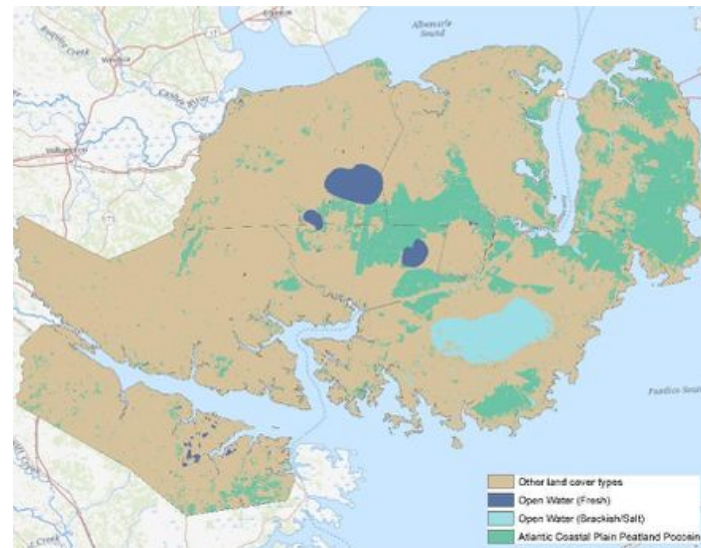
# NWL Climate Action: Implementation Case Studies

## Wetlands

### Background

- Wetlands are a diverse land type characterized by the presence of water a) covering the soil or b) at or near the surface of the soil continuously or for durations of time throughout the year ([EPA](#)).
- There are four types of wetlands: **marshes** (non-tidal and tidal), **swamps** (forested and shrub), **bogs** (northern and Pocosins), and **fens** ([EPA](#)). Each type of wetland has varying soil types, water chemistry, hydrology, vegetation, and more ([EPA](#)).
- The US Fish and Wildlife Service uses the Cowardin system for classifying wetlands for the [National Wetlands Inventory](#). This framework includes five major categories of wetlands: marine, tidal, lacustrine, palustrine, and riverine.
- Wetlands provide social and cultural benefits, habitat, sequester carbon, and help mitigate flood damage ([Narayan et al., 2017](#)).
  - For example, coastal wetlands "prevented about \$625 million in flood damages and reduced flood levels on more than 1,200 miles of roads in the Northeastern US" during Hurricane Sandy ([North Carolina Natural and Working Lands Action Plan](#)).

### Extent of Peatland Pocosin Vegetation Type in North Carolina



North Carolina's [North Carolina Natural and Working Lands Action Plan](#) includes priority recommendations for restoring and enhancing floodplains and wetlands, including Pocosins.

Source: [North Carolina Natural and Working Lands Action Plan](#)





# NWL Climate Action: Implementation Case Studies

Innovative  
Funding/Financing

## Wetlands

### Case Study: Bayou Grande Cheniere Marsh Restoration in Louisiana

In the aftermath of Hurricanes Katrina and Rita in 2005, Louisiana began an aggressive, science-driven, and integrated approach to addressing its land loss crisis. Implementing the state's Comprehensive Coastal Master Plan, Louisiana has constructed 60 miles of barrier islands and berms, improved 336 miles of levee, and benefitted nearly 49,000 acres of its coastal ecosystems, which buffer communities from storms and sea level rise and provide critical habitat. Wetland restoration and conservation is also a key component of the State's [2022 Climate Action Plan](#) to achieve net-zero carbon emissions by 2050.

The Bayou Grande Cheniere Marsh and Ridge Restoration project was initially managed under the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), a federal program with five federal agencies and the state of Louisiana, and then transferred to the state for implementation with funds from the Deepwater Horizon Natural Resource Damage Assessment (NRDA). In 2022, the project received an additional grant from the National Fish and Wildlife Foundation (NFWF) Emergency Coastal Resilience Fund, which pools funding from the National Oceanic and Atmospheric Administration (NOAA) via the FY 2022 Disaster Relief Supplemental Appropriations Act and funds from the Bezos Earth Fund. The project will dredge sediment from the Mississippi River to restore approximately 500 acres of coastal marsh habitat and 12 acres of forested coastal ridge helping to build a southern land bridge in the Barataria Basin and protect coastal communities from flooding.



# NWL Climate Action: Implementation Case Studies

Innovative  
Funding/Financing

## Wetlands

### Case Study: Bayou Grande Cheniere Marsh Restoration in Louisiana (continued)

#### Keys to Success:

- ❑ **Turn disaster into opportunity.** While the 2010 Deepwater Horizon oil spill caused enormous and tragic damage to coastal ecosystems, settlements from the spill have allowed Louisiana to accelerate large-scale wetlands restoration with climate change in mind.
- ❑ **Use existing projects to build momentum for landscape-scale action.** This restoration project is a component of a basin-wide suite of restoration projects including the completed Lake Hermitage Marsh Creation project (~700 acres) and the Bayou Dupont and Long-Distance Sediment Pipeline Projects (~1,600 acres); the under construction Large-Scale Barataria Marsh Creation (~1,100 acres) and Spanish Pass Increment of the Barataria Basin Ridge and Marsh Creation project (~1,500 acres); and the awaiting permit Mid-Barataria Sediment Diversion project, one of the largest ecosystem restoration projects in the nation. The diversion will reconnect the Mississippi River to its adjacent wetlands with a controlled structure that will build and sustain between 13,000 and 26,000 acres of wetlands over 50 years and extend the life of other restoration projects in the vicinity.



Source: Louisiana Coastal Protection and Restoration Authority

#### Resources:

- [Mid-Barataria Sediment Diversion](#)
- [Grande Cheniere Ridge Marsh Creation](#)



# NWL Climate Action: Implementation Case Studies

Diverse  
PartnershipsInnovative  
Funding/Financing

## Wetlands

### Case Study: Wetland Restoration to Reduce Flood Damage in Tillamook County, Oregon

Between 1996 and 2000, Tillamook County experienced over \$60 million in losses due to flooding. To address flooding in the Tillamook Bay area in Northwest Oregon, diverse stakeholders collaborated to explore innovative proposals, including Oregon Solutions, City of Tillamook, Oregon Office of Emergency Management (OEM), US Fish and Wildlife, and local dairy farmers and landowners.

The stakeholders elected to restore a tidal wetland that had been altered due to the construction of dams and levees, restoring 14 miles of natural channels. The project has not only minimized the impacts of flooding in the community and bolstered community resilience, but has expanded green spaces and wildlife habitat, including for the Oregon Coast coho salmon, improves water quality, and sequesters carbon.

### Keys to Success:

- ❑ **Investments in NWLs can support diverse objectives.** The restoration project in Tillamook County not only sequesters carbon, but provides many social and cultural, environmental, and economic benefits.
- ❑ **Stakeholder engagement is critical to project success.** Alternative project proposals would have required the removal of approximately 400 acres of grazing and pastureland and had a lack of landowner support.
- ❑ **Project support among government agencies and officials is critical.** The original proposed action was rejected by FEMA. An appeal supported by two US Senators, a member of Congress, and the Governor of Oregon, was ultimately successful.


### Resource:

- [Natural Infrastructure in Oregon](#) (see page 30-31 for additional information about this project)


# NWL Climate Action: Implementation Case Studies

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## Part 5–Key Takeaways

 Alliance states are pursuing ambitious strategies to enhance the contribution of NWLs to state and national climate goals. The case studies in this section illustrate how state policies and programs, innovative funding/financing strategies, and diverse partnerships contribute to ambitious state climate action. Qualities that are characteristic of many NWL implementation strategies include:

- Stakeholder engagement
- Collaboration among state departments and agencies, as well as non-state partners
- Tracking, evaluating, and sharing progress
- Clear link to state climate goals
- Developing and implementing short- and long-term priorities and actions

 As evidenced by the case studies in this section, enhancing the contribution of NWLs to state and national climate goals can support social and cultural, environmental, and economic well-being.

# 6. Conclusion, Next Steps, and Additional Resources

Section Objective and Overview

Conclusion

State Roles and Responsibilities: Opportunities to Further NWL Climate Action

Federal Opportunities To Enhance the Contribution of NWLs to State and National Climate Goals

Additional Resources



# Conclusion, Next Steps, and Additional Resources

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## Section Objective and Overview



### Section Objective:

- Review key takeaways, propose next steps, and provide additional resources



### Section Overview:

- Key takeaways
- State roles and responsibilities to further NWL climate action
- Federal opportunities to enhance the contribution of NWLs to state and national climate goals
- Additional resources



# Conclusion, Next Steps, and Additional Resources

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## Conclusion—Key Takeaways

### Part 1:

- The USCA is a bipartisan coalition of 24 governors working together to achieve the goals of the Paris Agreement and keep temperature increases below 1.5 degrees Celsius.
- The goal of this Guide is to provide guidance on how to integrate and fortify the role of the NWL sector in achieving economy-wide goals for USCA member states.

### Part 2:

- Integrated economy-wide and sector-specific goals/targets are critical to mitigating and adapting to climate change.

### Part 3:

- NWLs are critical to achieving the goals of the Paris Agreement to limit global warming to 1.5 degrees Celsius.
- NWLs are managed for a variety of primary objectives: the production of food and forest products, carbon sequestration and storage, tourism, open space, recreation, and private use. These management objectives influence how much NWLs emit, sequester, and store carbon.
- NWLs provide innumerable social and cultural, environmental, and economic benefits. To effectively enhance the contribution of NWLs to state and national climate goals, states should assess the role of NWLs in addressing climate change *and* the sector's social and cultural, environmental, and economic benefits.



# Conclusion, Next Steps, and Additional Resources

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## Conclusion—Key Takeaways

### Part 4—Section 1:

- Engaging stakeholders builds deeper in-state organizational capacity and a growing community of practice around climate action that helps strengthen public support for ambitious climate strategies.
- Accurate, consistent, transparent, and complete tools can facilitate widespread engagement and participation in setting and implementing climate goals/targets, thus fostering more effective and inclusive support for climate action.

### Part 4—Section 2:

- NWLs are not a guaranteed carbon sink. Setting strategic near- and long-term priorities can help states 1) maximize the carbon sequestration and storage potential of NWLs and 2) reduce emissions from NWLs.
- Increasing carbon sequestration *and* reducing GHG emissions from natural and working lands is a critical component of state and national deep decarbonization strategies.
- NWLs are a natural system and the uncertainty of estimating GHG fluxes for many NWL categories including forests, cropland and grassland soils, and land use change—is disproportionately large compared to other sectors.

### Part 5:

- Alliance states are implementing ambitious pathways (policies, practices, and programs) to enhance the contribution of NWLs to state and national climate goals.
- Enhancing the contribution of NWLs to state and national climate goals can support social and cultural, environmental, and economic well-being.






## Conclusion, Next Steps, and Additional Resources

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### State Roles and Responsibilities: Opportunities to Further NWL Climate Action

 This Guide identifies key strategies that states can pursue to enhance the role of NWLs to state and national climate goals. States, as possible, could consider funding the following positions to help take on these responsibilities and be a part of a state's climate team:

- **NWL Coordinator**
  - Work across natural resources agencies and departments to increase collaboration across all NWL sectors
- **Stakeholder Engagement/Facilitation Lead**
  - Engage diverse stakeholders to develop and implement a just and equitable NWL climate action strategy
- **NWL GHG Inventory Expert**
  - Track, evaluate, and share the role of NWLs in state climate strategies
  - Collaborate with economy-wide inventory experts to gather and improve emissions and sequestration data from state government and nonprofit and academic institutions (rather than relying on the easiest and fastest data to obtain, which may not be the most detailed or up-to-date)
- **Technical Assistance Providers**
  - Support the adoption of climate-smart practices by communicating and providing technical assistance to landowners on land management practices that have multiple benefits



## Conclusion, Next Steps, and Additional Resources

### Federal Opportunities to Enhance the Contribution of NWLs to State and National Climate Goals

#### The Inflation Reduction Act (IRA)

- The passage of the [Inflation Reduction Act \(IRA\)](#) is projected to put the nation on a pathway to achieving approximately 40 percent emissions reductions by 2030, representing historic investments in climate at the federal level. The IRA invests \$369 billion in energy security and climate change resilience investments and appropriates significant funding for natural climate solutions. Specifically, IRA invests in programs such as [Environmental Quality Incentives Program \(EQIP\)](#), [Conservation Stewardship Program \(CSP\)](#), [Regional Conservation Partnership Program \(RCPP\)](#), and [Agricultural Conservation Easement Program \(ACEP\)](#), as well as in conservation programs through the Natural Resources Conservation Service (NRCS) and appropriates funds for competitive grants to support private forestry for landowners, states, Tribes, and local governments.



## Conclusion, Next Steps, and Additional Resources

### Federal Opportunities to Enhance the Contribution of NWLs to State and National Climate Goals

#### The Bipartisan Infrastructure Law (BIL)

- The [Bipartisan Infrastructure Law \(BIL\)](#) provides funds for key programs that states, tribes and communities can use to meet a wide range of climate and resource management goals, such as increasing the health and carbon sequestration capacity of natural and working lands while building economic and social vibrancy.
- The BIL provides key opportunities for communities, states and tribes to implement critical projects to build climate resiliency through green infrastructure, ecosystem restoration and, where applicable, to work towards realizing climate targets through stewardship of the land carbon sink. Most of the funding available to subnational entities for ecosystem resiliency and green infrastructure comes through three categories of funding:
  - Grants to help communities plan and prepare for natural hazards and disasters,
  - Grants and investment in revolving loan funds dedicated to restoring watersheds and water infrastructure, and
  - Grants to manage forest health, including urban forests, and mitigate wildfire risk.
- While many of the funding opportunities in BIL may not explicitly mention climate mitigation or increased carbon sequestration as a target outcome, projects using this funding can be designed to provide maximum climate impact alongside other resource and resiliency components. The key to using BIL funding to advance climate action in the land sector is project design that prioritizes climate resiliency and carbon outcomes alongside water quality and resource outcomes and economic outcomes.



## Conclusion, Next Steps, and Additional Resources

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### Federal Opportunities to Enhance the Contribution of NWLs to State and National Climate Goals

#### 2023 Farm Bill

- The farm bill is a multiyear law that impacts many topics related to agriculture and food systems in the United States ([Congressional Research Service 2022](#)). The most recent [farm bill](#) was enacted into law in December 2018 and expires in 2023. As such, the 2023 farm bill is an opportunity to garner additional support for key programs that support NWL climate goals, including conservation practices, soil health, urban forestry, and avoided conversion—critical topics that Alliance states are addressing through a myriad of pathways (policies, practices, and programs). Five key programs that provide support for climate action on NWLs in the farm bill are as follows:
  - [Conservation Reserve Program \(CRP\)](#)
  - [Environmental Quality Incentives Program \(EQIP\)](#)
  - [Conservation Stewardship Program \(CSP\)](#)
  - [Agricultural Conservation Easement Program \(ACEP\)](#)
  - [Regional Conservation Partnership Program \(RCPP\)](#)



## Conclusion, Next Steps, and Additional Resources

### Federal Opportunities to Enhance the Contribution of NWLs to State and National Climate Goals

**New programs** led and/or supported by federal agencies are helping states enhance the contribution of NWLs to state and national climate goals:

- **America the Beautiful Challenge**, National Fish and Wildlife Foundation (NFWF)
  - The [America the Beautiful Challenge](#) is a public-private grant program that aggregates funding from federal agencies and the private sector to support "locally led ecosystem restoration projects that invest in watershed restoration, resilience, equitable access, workforce development, corridors and connectivity, and collaborative conservation, consistent with the [America the Beautiful Initiative](#)" (NFWF).
- **Partnerships for Climate-Smart Commodities**, US Department of Agriculture (USDA)
  - [Partnerships for Climate-Smart Commodities](#) is a USDA funding opportunity that aims to "finance partnerships to support the production and marketing of climate-smart commodities via a set of pilot projects lasting one to five years" (USDA). The projects funded in the first round of the opportunity (up to \$2.8 billion) are estimated to impact over 25 million acres of working lands and sequester more than 50 MMT of CO<sub>2</sub> (USDA).



# Conclusion, Next Steps, and Additional Resources

## Additional Resources

This Guide is not comprehensive and there are many other resources that go into greater detail on specific topics related to the role of NWLs in climate action. The below list offers additional resources that may be of interest to states seeking to learn more about how to sustainably and equitably enhance the contribution of NWLs to state and national climate goals.

### Additional Resources

- [A Menu of State Actions to Promote Forest Carbon Sequestration and Storage](#)
- [Blue Carbon Case Study Series: How North Carolina Became the First State to Incorporate Seagrass into their Blue Carbon Inventory](#)
- [Blue Carbon Case Study Series: How Oregon Developed One of America's First State-Level Greenhouse Gas Inventories for Coastal Blue Carbon](#)
- [Building Blocks for a Low-Carbon Economy: Catalytic Policy and Infrastructure for Decarbonizing the United States by 2050](#)
- [Context and Future Directions for Integrating Forest Carbon into Sub-National Climate Mitigation Planning in the RGGI Region of the US](#)
- [Designing and Communicating Net-Zero Targets](#)
- [Developing a State-Level Natural and Working Lands Climate Action Plan](#)
- [Economic Impacts of Investing in Climate Mitigation in New York Forests and Agriculture](#)
- [Economic Impacts of Investing in Climate Resilience Through Ecosystem Restoration in Washington State](#)
- [Fact Sheet: The Inflation Reduction Act Supports Workers and Families](#)
- [Greenhouse Gas Mitigation Potential of Ag Land Management in the US: A Synthesis of the Literature](#)
- [Greenhouse Gas Protocol and World Resources Institute-List of Land Sector Calculation Resources](#)
- [Greenhouse Gas Protocol—Land Sector and Removals Guidance](#)
- [Glossary of Natural Climate Solutions Terms](#)
- [Government Alliance on Race and Equity \(GARE\)](#)



# Conclusion, Next Steps, and Additional Resources

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## Additional Resources

### Additional Resources (continued)

- [Incorporating Coastal Blue Carbon Data and Approaches in Oregon's First Generation Natural and Working Lands Proposal](#)
- [Inflation Reduction Act: Agricultural Conservation and Credit, Renewable Energy, and Forestry](#)
- [Just and Equitable Transition State Policy Framework](#)
- [Land Sector and Removals Guidance \(Greenhouse Gas Protocol\)](#)
- [Natural and Working Lands Inventory Improvements: A Guide for States \(WRI\)](#)
- [Pathways to Paris: A Policy Assessment of the 2030 US Climate Target](#)
- [Playbook for Climate Action](#)
- [President Biden's Bipartisan Infrastructure Law](#)
- [Removing Forward: Centering Equity and Justice in a Carbon-Removing Future](#)
- [Soil Carbon Moonshot: Grounding Carbon Storage in Science](#)
- [Soil Health Policy: Developing Community-Driven State Soil Health Policy and Programs](#)
- [State Climate Policy and Nature-Based Solutions: A Match that Provides Multiple Benefits for Climate, Water, and More](#)
- [Testing Ecosystem Accounting in the United States: A Case Study for the Southeast](#)
- [The Bipartisan Infrastructure Law](#)
- [The Economic Benefits of the New Climate Economy in Rural America \(WRI 2021\)](#)
- [The Inflation Reduction Act of 2022](#)
- [USCA Resilience Playbook](#)
- [USN4C Guide for Decision-Makers](#)
- [Why Greenhouse Gas Inventories Are Important for Natural and Working Lands – and How to Fix Them](#)