

Agriculture and Ecosystems

Overview

Protecting, sustainably managing, and enhancing Vermont’s working and natural lands¹ provides a critical climate mitigation, adaptation and resilience opportunity. The “green hills and silver waters” referenced in Vermont’s state song represent a widely shared image of the Vermont landscape, with walkable and livable communities surrounded by farm fields and forested hills, all bounded by Lake Champlain and the Connecticut River. This image represents not just a shared sense of the past, but of the future, and represents a way of living on the land that is deeply embedded in Vermont’s cultural heritage and way of life. Today’s Vermonters are just the most recent group of people to have taken on the responsibility for stewarding a landscape that has supported humans since time immemorial. Protecting, stewarding and restoring these landscape features, including farms and working forests as well as our wild and undeveloped spaces and the rich diversity of life within this landscape, is necessary to life here for generations to come and is critical to achieving the climate mitigation, adaptation, and resilience benefits described in legislative findings of the [Global Warming Solutions Act](#).

¹ For the purposes of this document, we use the language “working and natural lands” as used (though not defined) in the GWSA Statute, a usage that implies a distinction between lands used to produce food, fiber and forest products for human use and consumption, on the one hand, and lands that are left in a natural and unmanaged state on the other. We note, however, that natural lands do work through providing ecosystem goods and services such as wildlife habitat, water quality, forage, shelter, spiritual sustenance, aesthetic value and many others. Conversely, working lands have natural features that provide these same benefits.

Rationale

Vermont's open landscape is not just beautiful but is also our greatest opportunity to both sequester greenhouse gas emissions and adapt to climate change. This landscape is already a significant source of carbon storage and sequestration, and improved protection, restoration and management of our forests and farms can further enhance this capacity. Further, Vermont would be at much greater risk from the increased intensity and frequency of extreme weather events but for the abundance of open lands, forests and fields, and healthy functioning watersheds.

The benefits of investing in Vermont's natural and working lands are not limited to the physical landscape, but also to our human communities. Our forests and farms are the source of food and forest products and are the foundation of Vermont's rural community economies. Through careful stewardship of our lands, we have opportunities to prioritize food security, ensure equitable land access and home ownership for Vermonters from historically marginalized or disadvantaged communities, and support landowners seeking to steward their land for its ecological and climate benefits. The Intergovernmental Panel on Climate Change (IPCC) emphasizes that sustainable land management can help meet climate goals, slow ecological crises, and provide access to nutritious food.² Education and financial support are essential in helping land stewards adopt practices that benefit the economy and the environment. Relying on science, braided with and informed by Traditional Ecological Knowledge, and drawing on a long and evolving history of land stewardship by Vermont landowners, our state can take advantage of and learn from the new ideas, concepts and information that demonstrate the many co-benefits associated with the implementation of policies aligned with our natural and cultural heritage.

Climate Mitigation Benefits of Natural and Working Lands

Vermont's landscapes play a crucial role in carbon sequestration and storage, helping to offset emissions while enhancing resilience. Natural climate solutions, such as conservation,

² [IPCC 2019: Special Report on Climate Change and Land](#)

restoration, and improved land management, increase carbon storage while preventing greenhouse gas emissions. When combined with aggressive emissions reduction efforts, they provide some of Vermont's most effective tools for addressing climate change.

Currently, Vermont's natural and working lands sequester and store significant levels of carbon. Preserving and enhancing this sequestration capacity requires supporting the people who live and work within these ecosystems. Landowners, farmers, and foresters must have the knowledge and resources to make informed decisions that reduce emissions while increasing carbon sequestration and storage. Thoughtful land management in forests, wetlands, and agricultural landscapes can ensure Vermont continues to capture more carbon than it emits. Public engagement, education, and careful planning are essential to align land-use policies with Vermont's climate goals while supporting local communities.

Forests especially play a critical role in Vermont's carbon storage in tree biomass and the organic soil layers beneath them. Forest protection, restoration and management should focus on maintaining these vital ecosystems, recognizing their importance for both biodiversity and climate resilience. While forests store carbon above ground, below-ground ecosystems—including soil microbial communities and root networks—are equally vital for long-term sequestration.

Vermont's landscape has undergone a dramatic transformation over the past century. A century ago, the state's forests had been reduced by logging and clearing for agriculture and development to only twenty percent of the landcover. Today, as a result of a shift away from a landscape dominated by small hillside farms, combined with land protection policies, nearly eighty percent of Vermont's landscape is forested. This recovery highlights the potential for ecosystem regeneration but also reveals a critical gap—many recovering forests lack the structural complexity and biodiversity of old-growth ecosystems. The current state of our forests, both in terms of the permanent conversion of forests to development, and in terms of the ecological health of our forests, underscores the need for proactive policies that ensure forests regain their ecological function rather than simply regrowing tree cover.

Vermont's landscape is continuing to transform as forest cover has been declining in recent years and farmland is under increasing pressure from development coupled with economic challenges faced by farmers. Carbon sequestration in agricultural landscapes is an emissions related strategy for agriculture that yields great co-benefits. Soil health is another essential but often overlooked aspect of carbon sequestration. Healthy soils store more carbon through the development of soil aggregates, root exudates that feed microbial life, and the formation of stable organic matter. Vermont can prioritize soil health initiatives by supporting farmers in adopting practices such as reduced tillage, nutrient management, manure management, cover cropping, perennial systems, riparian tree plantings, and managed grazing. These methods enhance soil resilience and contribute to long-term carbon sequestration, while also reducing carbon emissions and increasing local food production.

Another lens for understanding the importance of Vermont natural and working lands to achieving Vermont's goals for reducing and mitigating greenhouse gas emissions is watershed health. Protection and restoration of Vermont's headwater streams, wetlands, and floodplain ecosystems are all critical to achieving Vermont's climate mitigation goals. As some of the most efficient natural carbon sinks on a per acre basis, these landscape elements store substantial amounts of carbon. Low oxygen levels in wetlands slow decomposition and prevent carbon from being released as carbon dioxide. Additionally, wetlands continuously accumulate organic material, enhancing their carbon storage capacity over time. In contrast, when filled, altered, drained or degraded, these ecosystems release stored carbon back into the atmosphere. Protecting and restoring headwater streams, wetlands and floodplains is essential for maintaining their function as long-term carbon sinks.

Climate Adaptation Benefits of Natural and Working Lands

The northeastern region of the United States is already experiencing an increase in extreme weather as a result of climate change, including severe precipitation events, winter ice storms, drought, flooding, wildfires, temperature extremes, and localized wind events.³ Our

³ Climate and Climate Change Chapter, Vermont Updated Climate Action Plan 2025, <https://climatechange.vermont.gov/climate-action-plan-2025-update>; National Climate Assessment: <https://nca2023.globalchange.gov/>

region is also experiencing a general warming trend, with impacts including loss of outdoor winter recreation opportunities, ground conditions conducive to sustainable logging, the spread of invasive and pest species, loss of biodiversity, declining northern forest ecosystem health, and associated changes in forest structure. The breadth of climate change impacts on Vermont's communities includes not only disruptions to housing and business development, public health, energy, transportation, and recreation and tourism, but also disruptions to our working and natural lands – the agriculture lands, forests, and watersheds -- which are the foundation of our economic health, and the backbone of our mitigation and adaptation and resilience strategies.⁴

Vermont's forests and farms, wetlands, connected floodplains and river corridors all absorb excess water and reduce high, erosive energy during flooding events. These landscape features can also, when properly stewarded, serve as a buffer against droughts and other disruptions, increasing protections for the built environment in our communities and providing public health benefits. In addition, protecting and enhancing our natural and working lands will also provide critical habitat and landscape connectivity for the plants and animals which need refugia from the changes to their habitat resulting from climate change. Though the interrelationships within and among these systems are sufficiently complex to defy simple assertions in the near-term, over the long-term, the benefits to plants and wildlife resulting from protecting, stewarding and enhancing natural and working lands will, in turn, return benefits to Vermont's agricultural and forestry sectors and the people who depend upon them. Finally, supporting our natural and working lands will also increase protection for the built environment in our communities and provide public health benefits.

Climate change adaptation efforts focused on protecting and enhancing natural and working lands, requires significant investments, but climate experts agree that the long-term savings justify these investments, given the rapidly increasing cost of climate change impacts.⁵ Beyond economic returns, adaptation efforts yield myriad co-benefits – from building community resilience to sequestering and storing carbon, improving soil health to maintaining

⁴ Id.

⁵ IPCC Sixth Assessment Report, “AR6 Synthesis Report: Climate Change 2023”, <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>; Economics of Adaptation, Chapter 17, https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-Chap17_FINAL.pdf

habitat connectivity, and more.⁶ The recommendations in this section aim to increase the adaptive capacity of Vermont's natural and working lands and support watershed health, as well as enhance the resilience of our natural and human systems to a changing climate, through science-based, technical and traditional knowledge. The increased incidence of drought, extreme precipitation events, and changes in temperature patterns associated with climate change in Vermont have already begun to impact our natural and human communities and systems. At the same time, features of Vermont's natural and working landscapes have absorbed, buffered and reduced climate risks, such as the impacts of extreme precipitation and associated floods. Broadly, the strategies that the State of Vermont must take to secure the health, resilience, and benefits of climate adaptation and mitigation from natural and working lands include,

- funding, enhancing, and adapting programs that support greenhouse gas emissions reductions, carbon sequestration and storage, and climate adaptation and resiliency on our forests, fields and farms,
- utilizing best practices to account for carbon sequestration, storage, and emission reductions from agriculture and forestry,
- funding and implementing Payment for Ecosystem Services programs for lands to encourage implementation of practices that improve soil health, crop and forest resilience, increase carbon storage, increase stormwater storage capacity, and reduce runoff,
- creating dedicated climate impact emergency recovery funding for farms and forestry operations, and related infrastructure, supporting and expanding programs to support the adaptive capacity and restoration of farms and forests, and promoting insurance for farm and forest landowners and businesses, to ensure that they can equitably and viably recover from climate induced disasters,
- funding farm and forest supply chain resilience and state food security, and investing in storage, processing, and distribution infrastructure,

⁶ Id.

- promoting Vermont-sourced agricultural and sustainably harvested wood-based construction materials,
- protecting the supply and access to local food, fiber, and forest products,
- statewide planning and programs to promote landscape connectivity and durable land conservation strategies,
- incentivizing the use of nature-based solutions, traditional ecological knowledge and Indigenous knowledge to provide alternatives to engineered and technological solutions to adaptation and resilience,
- promoting healthy and connected river corridors, floodplains, and wetlands,
- engaging and supporting indigenous communities, communities of color, and underserved communities in the work of protecting and enhancing natural and working lands, and
- enhancing education, outreach, research, peer-to-peer learning, and technical assistance programming to encourage climate smart strategies by land and water managers.

Inter Connections

Vermont has historically invested heavily in policies and practices that protect its forests, farms and open spaces as well as the rich mix of wetlands, floodplains, streams, rivers, lakes and ponds that are vital to managing the increased threats of extreme weather, including flooding and drought, associated with climate disruption. The recommendations in this chapter should be seen as complementary to the array of existing statutes, policies, and programs that are playing a central role in protecting and enhancing the ecological, economic, and aesthetic qualities of our landscape through a mix of environmental and land use regulations, financial incentives, and education and outreach.⁷ The recommendations in this Chapter also assume continued and increased investment in the foundational programs established to support

⁷ Examples include Act 250, 30 V.S.A. § 248 (Energy Project Siting), state water quality and wetlands protections, local land use plans and regulations, Use Value Appraisal Program (“Current Use”) and the Vermont Housing and Conservation Act.

individual Vermont landowners, businesses and organizations who seek to steward their privately owned land through sustainable management and permanent conservation.⁸

In addition, ongoing initiatives such as the [Vermont Conservation Strategy Initiative](#)⁹, [Vermont Forest Futures Strategic Roadmap](#)¹⁰ and the work of the [Governor's Commission on the Future of Agriculture](#)¹¹ include ideas that will support and complement the strategies described in this Chapter. It is critical that a diversity of communities across the state continue to engage actively in defining and supporting the proposals that result from these efforts.

In conclusion, while the benefits of Vermont's forests and farms provide obvious adaptation and resilience benefits, these recommendations should not be viewed through only through that lens. Protecting and enhancing our natural environment and working lands also provides direct carbon storage sequestration opportunities so is tied to mitigation.¹² Further, management of Vermont's forests and farms has a direct connection to recommendations related to Vermont's energy future – both as connected to the role of biomass for combined heat and power, advanced wood heat, and agricultural waste methane generation, and as connected to renewable energy siting policy prioritizing the siting of new projects in already developed areas to reduce pressures on forests, farms and watersheds.¹³ These same strategies are also inextricably linked to the design and investment in building resilient, walkable, and livable communities, and a strong, sustainable economy.¹⁴

⁸ Examples include the Vermont Housing and Conservation Fund and the Working Lands Enterprise Initiative.

⁹ <https://vhcb.org/our-programs/VCSI>

¹⁰ <https://fpr.vermont.gov/forest-future-strategic-roadmap>

¹¹ <https://agriculture.vermont.gov/administration/governors-commission-future-vermont-agriculture>

¹² Cross-reference section of report describing relevant mitigation strategies

¹³ Cross-reference mitigation chapter recommendations relating to biomass and renewable energy siting

¹⁴ Cross-reference section of report describing relevant rural resilience and cross-cutting strategies