



## Care of Trees:

Guides to Living  
Forest Resilience



**MVP**  
Municipal Vulnerability  
Preparedness



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## Roots: Project Background

The Nashua River Communities Resilient Lands Management Project (“Nashua River Project”) is a two-year project supported by the Massachusetts Municipal Vulnerability Preparedness (MVP) Program working with the communities of Clinton and Bolton alongside a team of consultants to understand the potential for land use and land management policies and practices to support climate resilience and regeneration in the region over the coming decades. The tangible outcomes of this process include the guides for forest stewardship and care that you have in front of you, as well as a set of guides focused on turf and “ornamental landscapes” (e.g. parks, gardens), a set of regulatory recommendations and model bylaws that respond to the climate emergency, and a framework for ongoing community participation in decisions that affect the integrity and continued viability of our landscapes. The Nashua River Project is part of the implementation of a previous MVP Action Grant-funded project called the Apple Country Natural Climate Solutions Project, which examined opportunities to implement nature-based solutions in three Central Massachusetts towns (Bolton, Devens, and Harvard).

**To learn more about the Nashua River Project, visit the project website:**

<https://climateresilient.wixsite.com/nashuariver> (English)

<https://climateresilient.wixsite.com/rionashua> (Spanish)

## These Guides are for Everyone

The Guides to Living Forest Resilience take the stance that we and the forests and other forest species are all one system, but that there are multiple and diverse ways to be invested in forest care, and that a diversity of perspectives and approaches are critical to responsibly stewarding the lands of this one Earth that we all call Home. The framework adopted in these pages invites readers to ask, “What is the potential of our role as humans in caring for forest ecosystems and contributing to their health?” and, “How is it that forests care for us?” The suggested actions and recommendations are designed to support people in caring for the places where they live, work, play, and find meaning and connection, and above all, to encourage a commitment to continuous learning. These actions emerged from the Massachusetts Municipal Vulnerability Preparedness (MVP) Program working alongside the communities of Clinton and Bolton but they have regional, state, and global potential.

## Acknowledgments

The Nashua River project is taking place on the traditional territory of the Nipmuc Nation, including the Nashaway band of Nipmucs, who inhabited these lands and were forcibly removed from them around the time of the 1643 Lancaster purchase of land in the region by European colonizers. Land is essential to human understanding of our personal and collective identities, to our health and well-being, and to our very survival as a species on this planet. With this land acknowledgment, we recognize the violence inherent in the separation of a people from their territory, and the conflict and suffering that this continues to create today. The project team is working to include, collaborate with, uplift and celebrate the voices and priorities of Indigenous Peoples and institutions in this project, and in the ongoing fight for climate justice.

## Project Team Acknowledgements

The project team wishes to thank the following groups and individuals for their invaluable contributions to the process of building community resilience through stewardship and care of natural lands in Bolton and Clinton:

- The MA Municipal Vulnerability Preparedness Program, and especially Hillary King, MVP Central Regional Coordinator, for her ongoing support and stewardship of this project’s full potential;
- Rebecca Longvall, Bolton Conservation Agent, and Michael Ward, Clinton Town Administrator, for their municipal leadership and deep commitment to ensuring the project’s success and ongoing contributions to community health and resilience;
- All of the participants in the Forest Task Group and project Core Team, including Town Staff, representatives from State Agencies and Tribal Nations, local and regional nonprofit, business, and K-12 stakeholders, and many other local and regional stakeholders who have volunteered their time and expertise to create an inclusive and well-informed process that can respond to real community priorities and needs;
- Gloria Robles, Community Outreach Specialist and long-time Clinton resident, for her commitment to sharing the project and connecting deeply with the interests, values, and opportunities of Spanish-speaking communities of Clinton and Bolton.

## Welcome to the Resilient Forest

Forests are interconnected communities of diverse species inhabiting the soil below the ground surface, and all the way up to the tops of tree canopies, and extending across the landscape in an interconnected and interdependent community of living beings. Because many of these species are mobile, with some of them moving many miles each year (think forest birds), it can be difficult to draw a line around a forest and understand how patches of trees shape and are shaped by changing conditions over time. Climate change adds new dimensions to this process. It is a goal of these Guides to highlight possibilities and strategies for cultivating resilience in the forest systems that surround us here in Massachusetts.

One lens through which we can understand forest resilience is the life cycle of our forests. A present-day forest is in many ways a “snapshot” capturing a unique moment in the evolution of the forest over deep time. What we see today is the forest’s current position in an overall life cycle that is influenced by things like physical geography, soil, hydrology and weather patterns, and organisms including human beings, that have pushed and pulled in different directions over the ages. The advent of the glaciers, and the regional climate cooling that accompanied them, had caused tree species that thrived in warmer climates to migrate southward and disappear from what is now New England. As human-caused climate change drives rapid and unprecedented regional warming, some of these formerly native tree species may be poised for a comeback.

Since the time of the glacier’s receding from the last Ice Age more than 13,000 years ago New England forests have been influenced by Indigenous Peoples<sup>1</sup> and continue to be a primary source for their livelihoods and culture. Controlled burns, species selection, and swidden agriculture (cyclical slash & burn) shaped the understory and forest composition, among other active management and landscaping practices<sup>2</sup>. Certain fertile riverside lowlands were cleared and managed as permanent polyculture fields dominated by maize and sunflowers. This sophisticated and complex management resulted in a variety of successional phases leading to high structural and species diversity. Beginning with European colonization in the 17th century and proceeding well into the 19th century, the vast majority of Massachusetts forests (covering most of the state) were cleared for agriculture, including crops and livestock pasture. This kind of large-scale disturbance has, unsurprisingly, had long-term effects in the landscape. Even as forests have regenerated (today, Massachusetts has 62% forest cover, making it the 8th most forested state in the country<sup>3</sup>), their composition has changed<sup>4</sup>, and the legacy of this agricultural period includes effects like biodiversity loss, structural simplification, and proliferation of invasive species.

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### EXCERPTS FROM BRAIDING SWEETGRASS

#### “It’s all in the pronouns...”

“The animacy of the world is something we already know, but the language of animacy teeters on extinction...Our toddlers speak of plants and animals as if they were people...until we teach them not to...When we tell them that the tree is not a who, but an it, we make the maple an object; we put a barrier between us, absolving ourselves of moral responsibility and opening the door to exploitation. Saying it makes a living land into ‘natural resources’. If a maple is an it, we can take up the chain saw. If a maple is a her, we think twice...”

--Robin Wall Kimmerer<sup>5</sup>



Further, the colonial legacy of land use laws has created a system of ownership and commodification of land that stands in direct contradiction to Indigenous conceptions of the living beingness of the Earth<sup>6</sup>. Such a worldview creates a relationship of reciprocity and gratitude with the world that supports access to life-supporting benefits from natural systems but avoids degradation and destruction of those systems on the scale that precipitates the kinds of climate and biodiversity emergencies that we are experiencing.

The organization of land ownership and management initiated during European colonization contributes to forest fragmentation and other dynamics of degradation. The field of landscape ecology offers us another lens through which to understand these dynamics. The science of landscape ecology encourages us to think beyond property lines and town boundaries to perceive the patterns and processes that shape landscapes, flowing and shifting through different spatial and temporal scales. It offers a language to describe the anatomy of the landscape: "patches" are discrete places with a structure and ecological character distinct from the dominant surrounding landscape<sup>7</sup>. This dominant landscape is described as the matrix and shapes the ecological function like stormwater dynamics in a landscape. The sizes, type, structure, and connectivity between patches influence processes like species migration, water flow, and nutrient dynamics. Corridors including streams, railroad lines, road ways and ribbons of forest can serve as connections between patches or the barrier that divides them. The wetland complex behind Clinton's Trinity Masonic Lodge is a patch of forest in the matrix of a medium density neighborhood dominated by buildings and corridors of paved roads. When we zoom out, the matrix of this neighborhood becomes a patch within the largely forested region. Smaller-scale patches of trees like pocket forests found among towns and farms along with forested river corridors connect the larger wooded areas creating the regional forest.

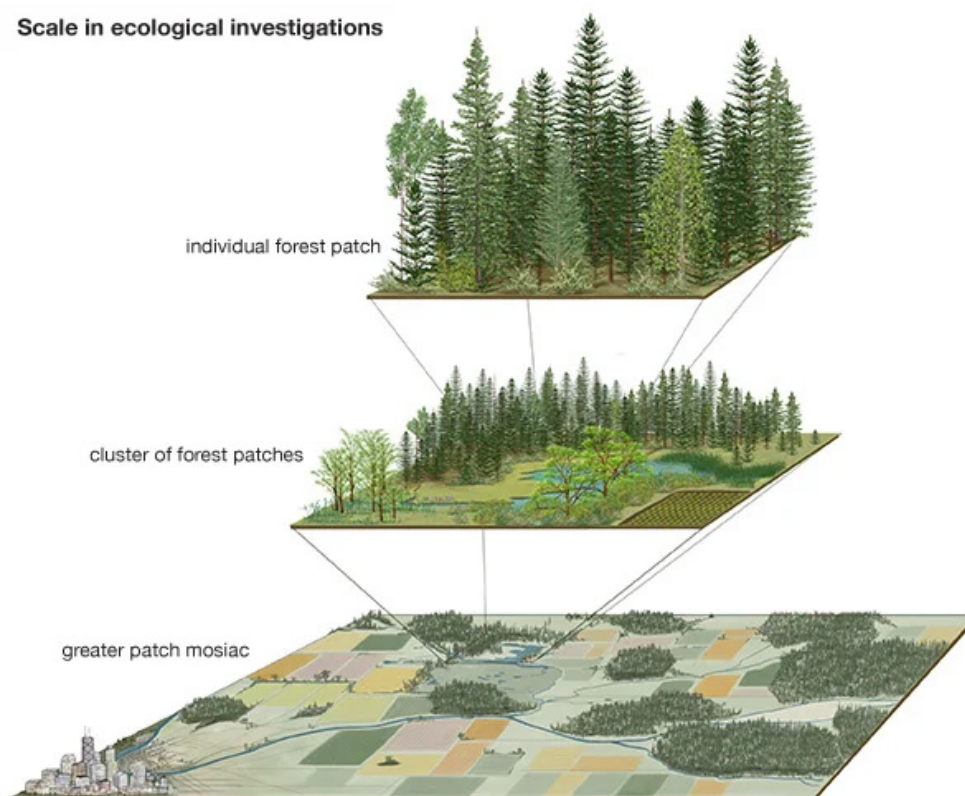


Figure 1: Diagram illustrates the relationship of a small section of forest to the patch of forest in a matrix of agricultural land use.

## FORESTS ARE EVERYWHERE! (WHAT WE MEAN WHEN WE SAY “FOREST”)

What is a forest, and how does a forest relate to the urban and suburban canopy? The USDA Forest Service differentiates between “forests” and “non-forest trees” based on three factors: tree density, land use, and patch size. These factors are defined briefly in the Forest Atlas of the United States and a summary can be found in the table below.

Tree Density	Land Use	Patch Size
<p>Tree density refers to the percent of the land covered by trees. Throughout the world, the most frequent measure of tree density is percent canopy cover. To be considered a forest land use, the land must either have or be capable of meeting a minimum canopy cover threshold.</p>	<p>Land use refers to how people interact with the land and how they intend it to be used. Forest land use requires that no activities are preventing normal tree regeneration.</p>	<p>Patch size refers to the minimum area required to be classified as a forest. In the United States, the USDA Forest Service defines this as one acre that is at least 120 feet wide.</p>

Using these three factors, forest land is then defined in the United States as “land that is one acre or greater in size and has at least 10% tree cover, or formerly had such tree cover and is capable of re-growing those trees.” It is also worth noting that this framework defines land use in terms of human interactions and intentions, which is consistent with an anthropocentric worldview that is not shared universally across cultures or with other members of the web of life, such as trees and other species inhabiting the forest.

Zooming out, we can think about the urban canopy itself as a type of forest, with its own unique qualities and characteristics, even though it may not meet the specific criteria set out by the Forest Service. A major goal in many urban areas is to increase tree canopy in anticipation of the many benefits that trees provide, such as stormwater management, cooling, shade, habitat, air purification, beauty, mental health, food, and intersecting all of these priorities, climate resilience<sup>9</sup>. Moving from urban to suburban and rural contexts at the regional scale, another major opportunity is to integrate patches of forest across the landscape as a whole (see p.XX for a discussion of the landscape ecology concept of “patches”). This strategy, reiterated throughout the pages of these Guides, has the potential to achieve many intersecting goals and create positive feedback loops to support increasing forest health and resilience over time.

Forests are also more than what meets the eye. Below-ground, the forest ecosystem is as rich and significant as its above-ground counterpart; in fact, the majority of the world’s biodiversity is found below the surface of the forest floor<sup>9</sup>. Roots, soils, mycelial networks (fungi) and microorganisms form the literal foundation of forest ecosystem health, enabling trees and other species to share resources, cycle nutrients, and store water, among many other critical functions. The forest underground is also key to climate change mitigation and resilience, accounting for the majority of the forest’s overall carbon storage and sequestration within the forests of Massachusetts. Forests are not only the sum of their parts: they are complex, evolving, and alive, at times exhibiting complex behaviors such as communication within and between species<sup>10</sup> as conditions change.



Forests are not only the sum of their parts: they are complex, evolving, and alive, at times exhibiting complex behaviors such as communication within and between species as conditions change (see Side Box below). With all of this in mind, it becomes clear that in order to protect forests, we need to account for the entirety of the forest ecosystem, including the enormous potential that is hidden from sight. With all of this in mind, it becomes clear that in order to protect forests, we need to account for the entirety of the forest ecosystem, including the enormous potential that is hidden from sight.

## CASE STUDY: THE WOOD WIDE WEB

In the 1990s, shortly after the Internet or “world-wide web” was popularized, Dr. Suzanne Simard, a forest researcher in the Pacific Northwest, conducted extensive studies documenting communication and reciprocal cooperation between two different tree species, paper birch and Douglas fir. She observed paper birches transferring carbon to Douglas fir trees through the below-ground fungal network (mycelium) that connects tree roots throughout the forest, and doing so in a sophisticated way that reflected awareness of the Douglas fir’s needs. In reciprocation, the Douglas fir gave carbon back to the paper birch when the birch needed it. Both species benefitted, and the overall health of the forest was strengthened. Dr. Simard states, “The sharing of energy and resources meant they were working together like a system. An intelligent system, perceptive and responsive.”<sup>11</sup> When the journal *Nature* published her paper as their cover story in August of 1997, they dubbed her discovery the “wood-wide web.”<sup>12</sup>

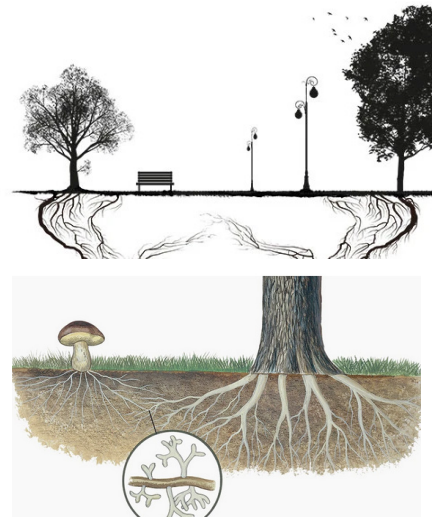


Figure 2 and 3 Sourced from [BBC Science Focus](#)

## FORESTS, TREES, AND CLIMATE CHANGE

Why are forests “valuable”? How do we know they are “healthy”, “biodiverse” and “climate resilient”? How are conditions likely to change over time, as patterns of human development continue to shift, and as climate change impacts intensify and accelerate? In this context, we need to consider characteristics like resilience to stressors and support for biodiversity, as well as ecosystem services/benefits, economic resources, and cultural heritage values provided by these landscapes when considering the health and values of the forest.

Increasingly common stressors affecting forests and trees include heat, drought, increasing storm frequency and intensity, flooding, invasive species, soil compaction and erosion, sea level rise and saltwater intrusion in coastal areas, as well as others. Healthy forests are better able to withstand the impacts of these stressors, and to retain their capacity to evolve with changing conditions while continuing to support diverse species over time. In many cases, the factors which contribute to forest resilience are the same factors that define forest health, including diversity of native and climate-resilient species, undisturbed soil and presence of beneficial downed wood, presence of old growth trees, avoidance of landscape-scale forest fragmentation, connection to other intact, large, undisturbed forests, and diversity of geology, soil and landform types.

Research<sup>15</sup> has found that large, older trees, sometimes referred to as “Mother Trees”, play a particularly central role in the health, resilience, structure and communication patterns of the forest. The largest, oldest trees have been observed to have the most root-mycelial (fungal) connections with other surrounding trees, and are connected to almost all of the young trees in their neighborhood. The young trees, it turns out, are growing out of a root-fungus network that provides them with nutrients, energy (carbon), water and chemical signals from the nurturing older trees, thus enhancing their likelihood of survival (see also Wood Wide Web Box, p.9). The pattern of the root-fungal network is one that resembles computer and neuronal brain patterns, with old trees serving as communication hubs in an overall system of centers (old trees) and satellites (young trees) that extends throughout the forest.

The communication and resource-sharing capacities of the deep-rooted and widely networked Mother Trees includes bringing deep water to the surface at night and sharing it with shallow-rooted plants to help the whole ecosystem survive dry conditions, and preferentially sending nutrients and carbon energy to their own offspring rather than to unrelated trees. Trees dying from insect infestation have been found to warn their neighbors and to send their own carbon through the below-ground root-fungus network to help fortify nearby trees, even when those trees are a different species. In-migrating species from more southern areas are being assisted by long-time residents as the forest system works as a coordinated whole to adapt to changing climatic conditions<sup>16</sup>. Thus, a key strategy in supporting the climate resilience of the forest is to protect and conserve the large, old Mother Trees and their role in the below-ground root-fungus network. Cutting and harvesting large, old trees has ramifications for the forest as a whole, and reduces its long-term climate resilience and biodiversity.

## ECOSYSTEM SERVICES/ECOSYSTEM BENEFITS

### OUR MISSION



Figure 4: Graphic from the Land Use Consultants (LUC).

The terms “ecosystem benefits” or “ecosystem services” refer to the myriad ways in which natural systems – and especially forests and trees – provide tangible and intangible resources which underpin human health and well-being, economy and society, and ultimately, survival. Here, we use these terms interchangeably, with a preference for “benefits” as a slightly more eco-centric term. Some examples of ecosystem benefits include carbon storage and sequestration, biodiversity and habitat, water quality and management, water supply, climate regulation<sup>13</sup>, air quality and public health, mental health, food and medicine, aesthetic and spiritual relief, localized and landscape/continental scale cooling, and many more. The only large scale atmospheric carbon removal pumps that exist today are forests, wetlands, and oceans, as technological carbon capture/removal methods are still in early stages of development and will take decades to operate at scale<sup>14</sup>. As these key ecosystems are degraded, cut, converted to other land uses, and destroyed, we reduce the Earth’s capacity to remove carbon from the atmosphere

# Principles of Forest Care

## WHY FOREST CARE?

This report comes from the Forest Task Group of the Nashua River Communities Resilient Lands Project, where members shared different perspectives, observations, and knowledges. This report distills and interprets their comments and insights, making explicit how to achieve the goals and principles that the group identified.

One key perspective that emerged from Task Group discussions is that we're all part of this living forest system. As participants, we need to protect the forests like we protect our family. Right now, this means actively helping forested areas (and areas of trees) to grow and age and protecting them from cutting. Helping larger, more mature forests to age into old-growth structure is a priority.

Another important action that springs from the understanding of forests as living systems in which we are all participants, is to work to restore the function and health of areas of degraded land. There are many areas in which land is in transition, like former agricultural fields or parking lots, or areas that are secondary to other primary uses, like roadside verges or freeway medians that could be restored to higher ecosystem functioning. There were different views on the Task Group about how best to restore degraded landscapes, but there was strong agreement that restoring ecosystem function and health were primary goals.

There are many places within the forest landscape that humans put energy into maintaining or managing. The living system view encourages us to focus management efforts on restoring and supporting the health of these areas and the ecosystem benefits that they could provide, if managed for those purposes. Landscapes such as forested strips along roadways or forested land adjacent to agricultural fields or forests that are being cut could be managed to strengthen patch connection and/or carbon sequestration with only a change in goals.

These actions, supported by a change in perspective that recognizes that we are all part of the living forests, would set in motion long-term changes that support climate health, human health, and forest health, with benefits now and into the future.

These guides shy away from using the term "forest management", which can refer specifically to the practice of forestry – that is, the production of trees as a resource commodity with benefits for people and economies, such as timber, biomass for energy production, paper products, and other commercially valuable materials. The guides also shy away from terms around the field of sustainable forestry, which focuses on forests as renewable resources, but still as resources to be consumed and controlled. Our goal for these guides is to integrate considerations such as climate change, biodiversity, protection of water resources, and recognition and respect for the rights of Indigenous Peoples, among many other ways of seeing related to ecosystem health and human rights into suggested actions<sup>17</sup>.

A local land trust or private landowner may have a strong interest in conservation, and harvesting may be absent or undertaken only in circumstances where trees pose hazards, or may happen on a small scale for specific purposes such as habitat management or to fulfill the requirements of state programs such as the Massachusetts Chapter 61 Forest Tax Program. Others hold the view that people should not manage forests at all – that forests should be preserved and protected from human influences entirely (the preservation perspective).

Among Indigenous Peoples of the Eastern Woodlands, approaches to forest management may vary widely, but are strongly connected to cultural, economic, and spiritual practices and beliefs, and often are based on a more reciprocal and respectful relationship with a recognition of the living beingness of places, trees, and the web of life. The history of colonization, as well as the conservation movement in the United States has created conditions of separation and struggle for Indigenous Peoples whose traditional ways of life have been disrupted by things like private land ownership, fencing, public infrastructure, and rules and regulations governing access to plants that grow in protected areas. Emerging partnerships between Tribes and Federal Agencies such as the USDA Forest Service are showing how traditional knowledge and practices can be integrated with Western forest stewardship in ways that strengthen the benefits provided to all<sup>18</sup>.

## THE VALUE OF MATURE TREES

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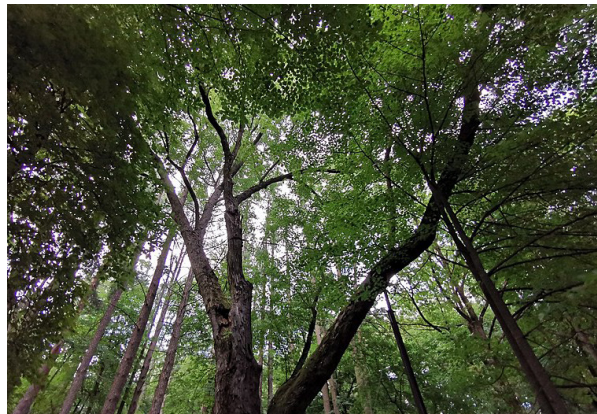


Figure 5: Photo sourced from [Wikipedia Commons](#).

When existing trees and forests are cut, most of their carbon winds up in the atmosphere relatively quickly after harvest, and the harvested sites generally become net carbon emitters for 10 - 15 years before reverting to net carbon sequesterers. Even if re-planting occurs and the new trees survive, it takes decades to centuries to recapture the carbon that was released during harvest. A young to intermediate-aged forest (such as 30 - 70 years old) may sequester carbon at a faster rate than a mature or old growth forest, however, it is in a significant carbon deficit due to the loss of carbon to the atmosphere that happens within a short time of the harvesting and continuing at the site for approximately 10 - 15 years. The carbon that has been released during and shortly after harvesting further exacerbates the warming of climate.

## CORE PRINCIPLES

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The Principles described below were developed over the course of the first year of the Nashua River Communities Resilient Lands Management Project in partnership with the Forest Task Group. The Forest Task Group was made up of diverse stakeholders from across the participating communities and the larger region, including local government officials and volunteers, land trust and conservation organization staff, Indigenous cultural stewards, forest researchers, public school administrators and teachers, state foresters, private landowners, and others. This group met five times over the course of the year, including two in-person Site Visits, which involved additional individuals in exploring forest conditions and potential on the ground in Bolton and Clinton. The Principles arose from the major themes that were discussed throughout these encounters about how people can engage with forests and trees in meaningful ways to enhance health, resilience, and vitality in their intertwined ecological and community contexts.

## 1. Learn by Observing and Interacting: Forests as Teachers

This principle encourages us to become students and participants in learning from the forest. What can we learn from the forest? Forests are, and always have been, dynamic, evolving communities. They change over time to adapt to changing conditions, and with time develop more ecological complexity and diversity. Humans have shaped forest structure and composition for millennia, and the idea that we are separate from nature is counterproductive because it perpetuates the idea that our own health and well-being can be sustained without regard for the health and well-being of the ecological systems of which we are a part and that sustain us. This Principle is about discovering what makes a specific forest unique by getting to know it so intimately that we think of ourselves as a part of it, in ongoing relationship with it, not separate from it. That way, we can learn to see through the eyes of the forest, and the actions we take to care for her can respond effectively to the unique history, needs, opportunities, and potential that exist there. This principle stands in opposition to “one size fits all” solutions. Our observations and interactions may take various forms, including noticing, measuring, recording, sensing, making, experimenting, and storytelling; we have the power to discover what is meaningful in and for the forest in many ways.

### QUESTIONS FOR CONSIDERATION

- What are the current threats and vulnerabilities to forests and trees, and what has contributed to them?
- What are the current opportunities and future potential of forests and trees, and what is needed to realize them?

## 2. See the Forests and the Trees: Forests as Nested Living Systems

This Principle is about learning to see and appreciate the ways that forests and trees interact across landscapes and scales, and how human systems of governance shape those interactions. Forests are not static objects; they are nested webs of living systems (see p. 9 for discussion of the “wood-wide web”).

Forests can be found in all kinds of environments, from urban to rural and in between, and the ways that those environments are planned, regulated, and governed have significant effects in the landscape. These living systems provide critical life support for all their member species, which humans sometimes refer to as “ecosystem services” or “ecosystem benefits” (see p. 10 for a list of examples). Further, biodiversity and ecosystem health are inextricably linked to human well-being and climate resilience (see also p.15).

When forests are stressed their ability to provide benefits to the larger ecosystem including humans can become compromised. By observing trees, forest patches, and larger forested areas at all of these scales, we can identify opportunities to relieve forest stressors and increase forest resilience. An individual forest patch makes contributions to the functioning, diversity, and connectivity of the regional forest, and the regional forest influences the forest patch in turn through effects like migration, pollination, and nutrient dispersal.

#### QUESTIONS FOR CONSIDERATION

- How is a tree or patch of forest contributing to the function, diversity, and connectivity of the local or regional system?
- What are the unique characteristics of the trees, patches, connections, their shape, composition, and position or location in the landscape?
- How is biodiversity being affected by past and current conditions? What trends can be observed, and are these consistent with our goals and the needs of the forest?
- How is a particular tree or patch of forest being impacted by climate change and other stressors (such as invasive species, disease, leaking gas lines, water and air pollution, soil erosion or degradation, dumping of human trash & debris, nearby pavement) How will they be affected over the coming decades?

### 3. Participate in Reciprocal Relationships: Forests as Partners

By changing our species' narrative of power over nature to one of balance and reciprocity with nature, we shift the paradigm for how we relate to forests, enabling a deeper relationship with nature that improves our stewardship of the land. When we take from the forest, we must also give back, or the forest will become depleted and suffer – and so will we humans. This is the true meaning of sustainability; reciprocity is the foundation of long-term resilience. As a starting point, this Principle reminds us to plant more trees than we harvest, to collaborate with Native American communities, to minimize impacts of tree and forest cutting, and to alleviate the stressors that already impact the forest. Beyond these initial ideas, we can begin to ask, what does the forest need? What does the forest want? And to be open to new understandings of what this can look like beyond the knowledge we may have today.

#### QUESTIONS FOR CONSIDERATION

- What do we receive from the forest, and how can we give back?
- What does the forest want? How can we work together with the forest to achieve our shared goals?

### 4. Encourage Diversity and Connectivity: Forests as Connections and Intersections

In areas with relatively high rainfall such as Massachusetts, forests are the predominant cover type. Microclimate in combination with soils, landscape position and time will influence what type of forest will occur. Over time, development of human settlements, roads, and other infrastructure has fragmented the forest that existed before colonization. As forest stewards, we can help heal this fragmentation by weaving together fragmented forest patches, in other words, strategically restoring forest connectivity. Forest fragmentation, caused by both physical and legal boundaries, has detrimental effects for people as well, by cutting off connections to the natural world and to each other. These same and other more destructive activities over the last 400 years have cut off the Indigenous peoples from the land and culture that sustained them then, as now.

Regenerating these connections can support healthy cultures, healthy ecologies, and human community inclusion and connectedness, for example by bringing balance and strength to the crossroads between stable

resilient forest patches and productive but vulnerable urban savannah. Through this lens, marginal spaces such as vacant lots, roadside shoulders, and utility corridors (among others) become valuable opportunities for forest restoration and regeneration that improves diversity and connectivity. In turn, they enhance human communities by creating inviting, cool, green spaces, thus improving human community and connectivity.

#### QUESTIONS FOR CONSIDERATION

- What are the natural boundaries at play in the landscape? What are the boundaries that humans have imposed? How are these working together or in conflict?
- How can we upgrade our understanding of forest systems to support and celebrate old growth forest structures with connectivity and forest diversity (including in human influenced and influencing landscapes?)
- How can we change our practices (e.g. development, culture) to ensure compatibility with living forest systems?

#### SIDE BOX:

#### ECOLOGICAL RESTORATION AND REGENERATION

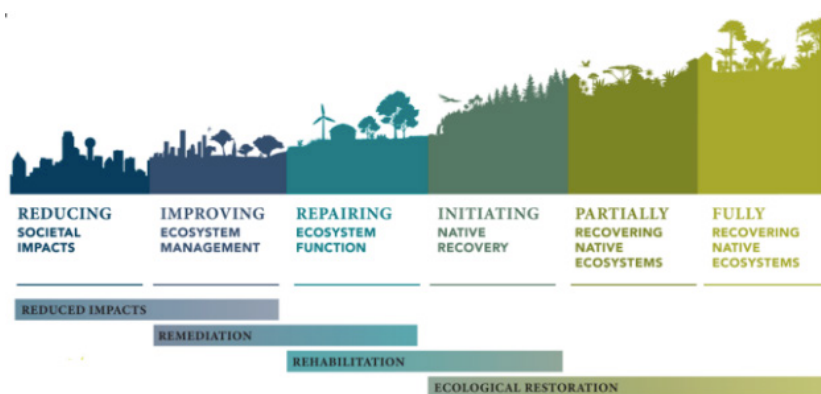


Figure 6: The Restorative Continuum shows the different phases of restoration (Society for Ecological Restoration, 2021).

The fields of regeneration and ecological restoration are actively evolving, and in this era of anthropogenic climate change, new paradigms are emerging to guide practices and the aims of these fields. Healthy ecosystems have the capacity to regenerate themselves. When human impacts are significant, ecosystem degradation and loss occur, and there is a need to restore ecosystem function so that it can regain its capacity to regenerate independently of human intervention. In other words, a degraded or destroyed ecosystem may require ecological restoration interventions in order to create conditions that will allow the ecosystem to become self-regenerating again.

In order to best protect and restore the native biodiversity of specific places, the practice of ecosystem restoration references the historic trajectory that the ecosystem had been on prior to experiencing human-caused degradation. However, with the growing impact of climate change, ecosystem restoration in some situations now requires adjusting restoration goals and approaches to allow for integration of new species or elements that will support healthy ecosystem functioning and a return to a fully regenerative ecosystem under changed climatic conditions. Designing for new conditions must be done carefully and with understanding of the site's context and history, but the ultimate focus is on supporting the capacity of living systems to regenerate, to evolve and to grow their adaptive capacity over time.

## 5. Focus on Function for Resilience: Forests as Dynamic Forces

This principle offers a framework for thinking about what it means to build forest health as large-scale patterns of temperature, precipitation, and other forces shift. In the context of enhancing forest resilience to climate change, it is helpful to think about restoration and regeneration. We can do this by thinking in terms of restoring functionality (which may or may not restore former conditions) and assisting the ecosystem to return to being a self-organizing ecosystem on a trajectory towards full recovery.

In some cases, this may mean managing invasive species or increasing native forest species biodiversity to prevent or reverse declines in ecosystem functioning; in others, it could look like introducing a non-native plant with characteristics that enable it to support healthy succession and establishment of resilient ecosystems under stressed conditions where native plants need help to establish or succeed, or as a means of adapting to our changing climate if native plants are less able to adapt. The key is to focus on sustaining healthy forest function and complexity, while preserving native biodiversity as much as possible, given changing climatic conditions and other stressors. Recognizing that forests are constantly changing and evolving, humans have the potential to play beneficial roles in these processes.

### QUESTIONS FOR CONSIDERATION

- Are the forest's soils functioning properly?
- Is forest hydrology functioning properly?
- Are species appropriately represented and to what extent can native forest biodiversity be protected and/or restored?
- Is the habitat intact and functioning as an integrated system?
- Is the forest in question well-connected to other intact areas?
- What stressors need to be addressed to restore healthy ecological functioning?
- Is the forest on a trajectory that will be resilient to anticipated climate changes?

## 6. Encourage Taking the Long View to Evaluate Success: Forests as Legacies

Forests are at different successional stages throughout this area – younger and older, more or less disturbed. As a result, forests will experience climate change impacts differently depending on their unique history and context. Continued development and land use change creates additional pressures on remaining forests, increasing both their value for climate resilience and their vulnerability. This Principle compels us to consider how we measure the health and resilience of forests over time by examining the degree of divergence between our intentions with forest care actions and the results that we observe over time. It also reminds us that the value of forests will continue to accrue into the future, as long as they remain cared for as forests (see Side Box, Big Trees and Old Growth Forests). With this awareness in mind, we are better able to consider the needs of the forest and develop appropriate goals that account for things like long-term patterns of succession and climate change projections. This Principle also reminds us that educating and empowering others to do the same is essential to this process, today and for future generations.



### QUESTIONS FOR CONSIDERATION

- What is the history of the forest we are interested in (e.g. human and other influences? What systems and events (natural, cultural, political etc.)?)
- What were the assumptions and principles of previous management approaches that have influenced this forest, and how far has the forest diverged from what was intended?
- What trajectory and outcomes are we anticipating from our actions in this forest today?
- Is the forest on a trajectory that protects biodiversity, ecological complexity, connectedness, and continued growth for large, old trees?
- How can we track that trajectory and those outcomes over time in ways that enable forest stewards of the future to know our intentions, measure outcomes, and understand what contributed to the outcomes observed?

## BIG TREES AND OLD GROWTH FORESTS: CARBON POWERHOUSES

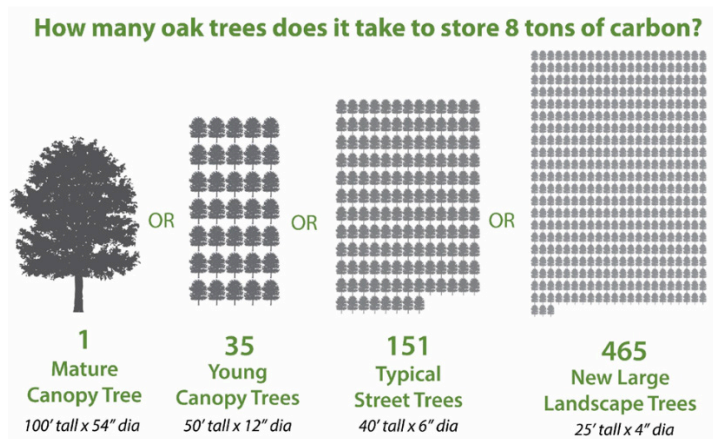


Figure 7: graphic created by the Regenerative Design Group.

Right here in Massachusetts, Bob Leverett, a former Air Force engineer who then worked as head engineer at a management consulting firm and as a software developer, has discovered pockets of old growth forest, when conventional wisdom had assumed they were long gone. Remembering his Southern Appalachian childhood amongst old growth forests, he has had a passion for finding and measuring these ancients of the world of trees. After years of measuring and collecting data about the giants and elders of New England forests, and collaborating with forest ecologists and climate scientists, Mr. Leverett has documented and demonstrated that, contrary to what many foresters, scientists, and even those in the conservation field thought, old trees, rather than young, fast-growing trees, store the most carbon on an annual basis<sup>19</sup>. Other researchers have had similar results in other parts of the country<sup>20</sup>.

Prior to Mr. Leverett's meticulous research and measurement of actual individual trees, many forest and conservation professionals had assumed that because young trees have a faster rate of growth than older, mature trees, that the younger trees stored more carbon per year, and thus cutting the old trees to allow younger ones to grow would be beneficial from a carbon and climate perspective. Research points to a different understanding. While the old giants do grow at a slower rate, their large size means that, for instance, Eastern white pines accumulate the majority (75%) of their total carbon once they are at least 50 years old<sup>21</sup>. It's like a bank account. Would you rather have a bank account that grows at a rate of 15% or one that grows at a rate of 5%? Well it depends...how much money is in the bank account to begin with? 15% of what? 5% of what? If the bank account is very small, say \$100, then a 15% return gives you \$15. If the bank account is very large, say \$1 million dollars, then a 5% return gives you \$50,000. The graphic above (fig. 7) is based on Bob Leverett's research.

# Guides to Forest Resilience

## OVERVIEW OF THE GUIDES

The Guides to Living Forest Resilience focus on opportunities to foster tree and forest health and resilience at the Neighborhood, Privately-Owned, Municipal, and Regional/State levels. The intention is to offer strategies for transforming governance and stewardship paradigms in ways that support whole ecosystem health, including human community health, well-being and climate resilience (see Principles 1 and 3). The structure of the Guides is not intended to silo strategies at each of these levels, but rather to draw attention to the interconnectedness between them (see Principle 2) while identifying ways for each of us working at our own level can contribute to the health and resilience of the forest across scales and settings.

Protect	Restore	Manage Better
<p>We need to protect the forests like we protect our family. Right now, this means helping forested areas (and areas of trees) to grow and age and protecting them from cutting. Helping larger, more mature forests to age into old-growth structure is a priority. Support for the health of the forests and ecosystems, so that the forests and ecosystems will support the health of our human systems is an important part of seeing ourselves as part of the living forests.</p>	<p>Work to restore the function and health of areas of degraded land. There are many forested or formerly forested areas in which land is in transition, like former agricultural fields or parking lots, or areas that are secondary to other primary uses, like roadside verges or freeway medians; that could be restored to higher ecosystem functioning. Similarly, open Indigenous access to culturally important forests and forest products needs to be restored throughout the region. (see appendix A for more details)</p>	<p>There are many places within the forest landscape that we already maintain or manage. The living system view encourages us to focus management efforts on restoring and supporting the health of these areas and enhancing the ecosystem benefits that they could provide, if managed for those purposes. Landscapes such as forested strips along roadways or forested land adjacent to agricultural fields or forests that are being cut could be managed to strengthen patch connection and/or carbon sequestration with only a change in goals.</p>

The Guides are organized by Neighborhood, Privately-Owned, Municipal, and Regional/State level in order to better serve the people responsible for forests at these different levels. The Neighborhood Forests Guidance starts with a simple premise: that neighborhoods are habitats for humans (and many other species!) nested in the midst of forests. Decisions at the individual household level can have effects that extend beyond the property line, and municipal and state policies, plans, laws, and programs also shape this context, as do the ecological care and conditions of the larger region. One neighbor alone cannot protect or regenerate the whole ecosystem health, but by working together and raising these issues in places like community meetings and neighborhood groups, residents can build local culture and resources to support everyone in connecting with and caring for neighborhood forests and trees and ensuring their health and resilience for future generations (see Principle 6).

The Privately-Owned Forests Guidance is driven by the fact that in Massachusetts, over half of all forest lands (approximately 63%) are privately-owned, with the vast majority of those being family-owned forests. Privately-owned forests face many pressures, and provide many benefits to their communities, from economic

to ecological and cultural. Private forests experience a range of conditions, but because of their extent, are more likely to include large areas of intact forest that, if protected and cared for, can provide long-term stability and resilience to the forest as a whole. Private forests close to urban and suburban areas are more likely to face development pressures, as well as stressors associated with those environments, from fragmentation to increased heat exposure. Recognizing these pressures and valuing the contributions of private forests is key to realizing their potential for climate resilience (see Principles 4 and 5).

The Municipal Forests Guidance highlights the myriad ways that cities and towns oversee and have the potential to nurture the health of forests, trees, and communities, including directly on municipally-owned lands and through policies and partnerships across scales. Municipalities often manage street trees and conservation areas, pocket forests and urban green spaces where trees are essential elements of ecosystems and community life. They additionally oversee actions on private lands through wetlands and development-related bylaws and regulations, responding to resident inquiries and ensuring compliance with frameworks at the state level as well. As a result, the potential to support native forest biodiversity and connectivity at the municipal scale is especially significant (see Principle 4). Municipalities are often balancing many important priorities to meet community needs, and resources to support this work can come at a premium. Dedicated funding and staff support are needed to realize the full potential of municipal action for forests.

The Regional/State Forests Guide aims to capture the diversity of actors and stakeholders at this scale, acknowledging multiple viewpoints while providing strategies that can be undertaken in partnership by finding alignment between shared values and goals. Thinking about the landscape on a regional level invites us to consider the many contributions to the whole at each of the other scales and levels of governance addressed by these Guides, and remember how actions at the regional level have influences throughout these nested systems (see Principle 2). This is important because fragmented and isolated efforts to care for trees and forests will inevitably lead to fragmented and isolated landscapes and communities. Critical opportunities for regeneration exist where partnerships are aimed at repairing human relationships to the forest (see Principles 1 and 3), whether through respect for Indigenous knowledge and stewardship, leveraging legal frameworks and regulations, or expanding grant programs, land conservation, and public access to forested lands.



# NEIGHBORHOOD

## THE FOREST IN MY BACKYARD

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Connect neighborhood forests to each other and to larger patches of land



Tree protection and strategic replanting after tree removal



Protect and regenerate neighborhood soils

Urban and suburban landscapes can often feel distinctly different from what we think of as forests, and yet they are part of a larger landscape context that is heavily forested, and are often (though not always) themselves quite brimming with trees. Still, we tend to view cities and neighborhoods as separate from forests. This way of seeing things tends to reduce trees to the status of “useful features” in the urban/suburban environment, limiting our ability to see the full range of opportunities they present.

A helpful reframing can be to think of our neighborhoods as habitats for humans (and many other species!) nested in the midst of forests. While they may not always look or feel like our standard definition of a forest, our neighborhoods – including the trees on our streets, in our parks, and in our backyards – make up whole ecosystems that interact with and contribute to the health and well-being of local residents (human and non-human), and of the greater region. As this understanding gains momentum, new approaches to landscape maintenance emerge that can have cultural and aesthetic implications. The paradigm shift toward more regenerative relationships with our neighborhood landscapes requires support from neighborhood peers, local government, broader cultural influences, retail and commercial providers, and more.

We can begin by taking the time to observe what’s around us, looking closely, acknowledging and engaging curiously with life close to home. We can start conversations with our neighbors to learn more about how they are approaching these issues, and discover opportunities to work together toward shared values of ecological and community health. The best advice for urban forest and tree management today may not be the best advice tomorrow, therefore we are called to remain open to evolving our understanding of how best to care for our neighborhoods together. By inviting people into a shared process of continual learning and improvement over time, we can make a commitment that will have meaning for generations to come.



## Tree protection and strategic replanting after tree removal

Protecting healthy mature trees is one of the easiest and most effective ways we can ensure the long-term resilience of our neighborhoods and ecosystems, including the stored carbon in the forested landscape. Young trees also require care and protection as they grow to ensure they remain healthy and are able to adapt to changing conditions over time. Similar to the way in which wetlands have long been recognized and reinforced through state and local legal and policy protections, the many and varied benefits of trees in urban and suburban environments are being appreciated more and more as the overall footprint of human development continues to expand.

When a mature tree is removed, the ecosystem benefits lost far outweigh the gains achieved by planting a new tree. Mature trees store water and carbon at much higher rates, for instance, and provide significantly greater cooling and habitat than younger trees. Very large, older trees, sometimes referred to as “Mother Trees” (see p.17), tend to be the most connected to other trees belowground. They are key nodes in the below-ground “wood-wide web” – the tree/mycorrhizal communication network – and provide nutrients to younger trees and trees that are stressed (see p.9). Whether a tree is removed due to a hazard it poses or because a new dwelling is being built, replanting can go beyond simple replacement to support stronger ecosystem regeneration.

### ACTIONS

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#### Protect

- Deepen and transform our relationship with trees and forests (Core Principle 3), and learn about how trees communicate and interact.
- Advocate locally for tree protection and replanting regulations that uphold the intentions of the actions outlined above.
- Monitor neighborhood trees for the presence of invasive insects such as the Emerald Ash Borer (case study p.22). Report anything you find to state and local authorities; early detection is key for preventing spread and tree death.

#### Restore

- Replace hazard trees and trees lost to damage, disease, or development at a ratio greater than 1:1 or in direct proportion to the diameter (DBH) lost, in locations that reduce potential hazards and provide additional benefits like windbreak, desirable shading, or convenient access to food crops.
- Plant new trees with climate adaptation in mind. Select native and climate tracking species<sup>22</sup> that can best withstand the neighborhood environment and continue to thrive (see Table 1, below).

#### Manage Better

- Protect naturally regenerating native tree seedlings from grazing and other damages by placing a wire mesh enclosure or other protection around them while they are small and vulnerable. Naturally regenerating tree seedlings that grow in situ from a seed are often healthier and more resilient than transplanted seedlings and saplings grown in nurseries.

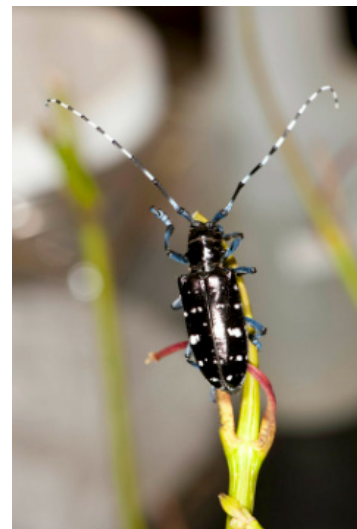
The following table provides tree species and predictions of how competitive they will be in the future. The values following each species name indicate whether species-suitable habitats will increase (+), decrease (-), or stay the same (●) under projected climate change.

Northern New England (Ecological subsections M211A, B, C, and D, and M211E and J)			Southern New England (Ecological subsection M221A)		
Tree Species	Low Emissions (PCM B1)	High Emissions (GFDL A1F1)	Tree Species	Low Emissions (PCM B1)	High Emissions (GFDL A1F1)
Balsam Fir	-	-	Balsam Fir	-	-
Black Spruce	-	-	Black Spruce	-	-
Northern White Cedar	-	-	Eastern White Pine	-	-
Paper Birch	-	-	Northern White Cedar	-	-
Red Spruce	-	-	Paper Birch	-	-
Tamarack	-	-	Quaking Aspen	-	-
White Spruce	-	-	Red Spruce	-	-
American Beech	●	-	White Spruce	-	-
Quaking Aspen	●	-	Tamarack	-	●
Sugar Maple	●	-	American Beech	●	-
Yellow Birch	●	-	Northern Red Oak	●	-
Bear/Scrub Oak	●	●	Red Maple	●	-
Bigtooth Aspen	●	●	Yellow Birch	●	-
Eastern White Pine	●	●	Bear/Scrub Oak	●	●
Red Maple	●	●	Black Cherry	●	●
American Basswood	●	+	Sugar Maple	●	●
Bitternut Hickory	●	+	Bigtooth Aspen	+	●
Black Cherry	●	+	Pitch Pine	+	●
Pitch Pine	+	●	American Basswood	●	+
Black Birch	+	+	Bitternut Hickory	+	+
Black Oak	+	+	Black Oak	+	+
Chestnut Oak	+	+	Chestnut Oak	+	+
Northern Red Oak	+	+	Shagbark Hickory	+	+
Shagbark Hickory	+	+	White Oak	+	+
White Oak	+	+	Threatened by Current Forest Health Issues (Do not target)		
Threatened by Current Forest Health Issues (Do not target)			Black Ash	-	-
Black Ash	-	-	Eastern Hemlock	●	●
Eastern Hemlock	●	●	White Ash	●	●
White Ash	●	●			

Projected change in suitable habitat in the year 2100 based on Tree Atlas projections for a given ecological subsection. Prasad, A. M., L. R. Iverson, S. Matthews, M. Peters. 2007—ongoing. A Climate Change Atlas for 134 Forest Tree Species of the Eastern United States [database]. www.nrs.fs.fed.us/atlas/tree, Northern Research Station, USDA Forest Service, Delaware, Ohio.

## CASE STUDY THE WORCESTER TREE INITIATIVE

The Worcester Tree Initiative<sup>23</sup> emerged from a response to invasive insects – specifically, the Asian Longhorn Beetle<sup>24</sup> (ALB) – destroying significant swaths of existing neighborhood trees in Central Massachusetts. The initiative replanted trees lost to the ALB infestation and worked to strengthen the urban forest by training and educating the community in care and maintenance of trees, engendering a sense of value and supporting community investment in the process. Trees were replanted throughout Worcester’s neighborhoods as well as in surrounding towns, including in Clinton’s Central Park. Strategies to ensure their health and survival over time were developed, such as a summer watering program that employs local youth and raises awareness among residents about the need for tree planting follow-up care. Today, the ALB is no longer an emergency threat to trees in the region. Since its founding, the Worcester Tree Initiative has expanded beyond the replanting of the 30,000 trees lost to become a force for community-based tree stewardship, working with hundreds of students and volunteers annually to educate and engage local residents. Other invasive insects such as the Emerald Ash Borer, Spongy Moth, and Hemlock Woolly Adelgid pose potential threats throughout the region, and an educated and engaged community can play a critical role in responding.





## Connect neighborhood forests to each other and to larger patches of forest

A forest finds, fills, and flexes boundaries. This means that forest patches on the edge of developed areas respond and regenerate differently than do interior forest patches that have remained relatively undisturbed over time. At one time, Massachusetts was almost entirely forested. Few forests now remain in the Commonwealth that existed before the late 19th century, yet many forests have returned with or without human intervention. However, in our neighborhoods, most of the trees we encounter are there because people have declared their value and importance to the community.

Parks are not the only elements of the urban forest. Though they may be the first to come to mind, they represent a minority of forests in the urban environment. The byway, alley, vacant lot and canal are also their own forest, one that is young, novel and successional, a community of pioneers and immigrants. These trees are making a thin living, but this is a natural and necessary step in working toward a healthier future. As new and evolving landscapes, these areas have the potential to contribute to environmental justice goals, and can easily be positively influenced by the people who occupy them. Connecting people to their urban forests can have exponential benefits relative to the level of investment needed to maintain the forests. Building local knowledge and appreciation of these forests can lead to healthier canopies, soils, and more resilient neighborhoods in turn. Done right, our hope is this narrative can supplant the current narrative of forest, nature, health, and prosperity being aspects of a distant suburban or rural land in which urban dwellers have no influence or right.

Increasing connectivity between patches of forests in urban and suburban areas can help to strengthen their ecological vitality, as well as their meaning for local residents. Greenways and interconnected open spaces can provide opportunities for many species to migrate safely across longer distances, including people! Increasing forest connectivity between urban, suburban, and rural areas can also carry with it risks that need to be considered as part of a larger strategy. Because of the higher degree of stress faced by urban trees from things like soil compaction, contamination, and urban heat, these trees can be more vulnerable to pests and disease, but increased soil connectivity, density, and diversity mitigate these stress factors.

## ACTIONS

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### Protect

- Observe and interact with the forests and trees of the neighborhood, asking key questions in the process.
  - Identify neighborhood patches of trees and forests – What state of health are they in? What do they need? What do they want? What separates them? Where are there opportunities to strengthen their health and connections to each other?
  - Identify larger urban forest patches in the landscape – What state of health they are in? Are they healthy intact forests, successional, or in recovery, or are they experiencing challenges from impacts such as invasive species, climate change? How might they interact with neighborhood forests as interconnections are strengthened? If healthy, are there risk factors from neighborhood forests that need to be mitigated as connectivity is increased? If previously disturbed, how might increasing connectivity serve to heal or pose increased risks?

## Restore

- Plant forests, pollinator gardens, and other supporting ecosystems in our yards and along streets to enhance biodiversity and overall benefits for people and ecosystems.
  - Leverage the food production advantages of urban savannah to support bird pollinator and macroinvertebrate populations that support broad ecological resilience.

## Manage Better

- Target corridors for street tree planting, pocket forest planting, creation of parks with trees, protection and expansion of tree root zones, and citizen planting care/monitoring/watering programs (see Worcester Tree Initiative Case Study, above).
  - Target passive open spaces for afforestation. These include margins, parking areas, cemeteries, and storage areas.
  - Add 'old growth' qualities to urban plantings through biomimicry to extend habitat into urban areas for species connectivity and to compensate for loss of habitat caused by impervious surfaces.
  - Identify drainage patterns where planted buffers or rain gardens can separate roads from residential areas and add additional types of habitat, infiltration, and sequestration.
  - Identify land use patterns where planted buffers, hedgerows, and swales can separate roads from forested areas and be used as monitored buffers where contamination or invasive species can be easily identified and controlled.

## CASE STUDY: RAUSCHER FARM'S PROPOSED POLLINATION SYSTEM

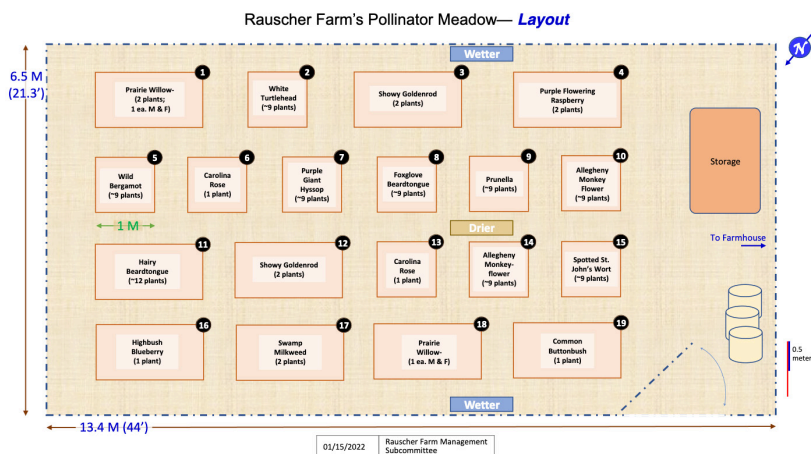


Figure 8: Plan of the Rauscher Farm Pollination System Garden layout.

The Rauscher Farm pollination system<sup>25</sup> was designed with input from Professor Robert Gegear, Assistant Professor of Biology at UMASS Dartmouth “to enhance plant-pollinator interactions to benefit both pollinators and plants”. A “pollination system” is not necessarily a “pollinator garden” because pollination systems must meet specific native planting requirements. The native plants accommodate specific local pollinators. For example, species of long-tongued bumblebees require specific plant designs that will be accommodated in the proposed pollination system at Rauscher Farm.





## Protect and regenerate neighborhood soils

Forests and trees catch and transform huge quantities of carbon, water, and sunlight into living branches and healthier soils. The branches and leaves of these trees keep neighborhoods cooler by shading them directly and through the natural air conditioning provided by transpiration. These soils not only support green spaces where people can play, and habitat for diverse organisms, but also capture stormwater and filter nutrients from that water at much greater rates than compacted and depleted soils. More nutrients and additional water availability help trees flourish and contribute to a mutually beneficial feedback system between soils, trees, and all of the organisms in the neighborhood, including people. The following actions can be implemented, with some planning and maintenance, to help trees, soils, and people thrive. Some of these actions can be taken by individuals while others require advocacy with local municipalities.

### ACTIONS

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#### Protect

- Protect large trees. Favor pruning of dead and dying limbs over removal wherever possible.
- Prune for hazards and retain dead and dying branches in live trees or on site to the extent practical.
- Protect naturally regenerating seedlings from herbivore grazers and other damages.
- Advocate for putting utilities underground to eliminate conflict between trees and powerlines.
- Maintain and increase ground cover, with either living plants, natural leaf litter, or mulch.
- Maintain roots in the ground, both alive and dead. When trees are removed, grind stumps rather than pulling the roots.
- Preserve woody debris, standing snag trees, and nurse logs as valuable habitat for biodiversity and as sources of future soil organic carbon in neighborhood forest patches.

#### Restore

- Increase total tree canopy within neighborhoods.
  - Encourage neighbors to plant climate adapted shade trees in their front yards, and Neighborhood Associations to require these types of plantings.
- Where tree removal is required, replant long-lived, urban-adapted trees like pin oak and hybrid elms in 'tree strips' that will cast shade on road surface and other impervious surfaces.
- Plant trees in connected strips rather than individual pits to enable more mature form and greater underground connectivity, among other ecological benefits.
- Improve connectivity between soils by replacing asphalt and concrete sidewalks and driveways with flexible, permeable paving.

#### Manage Better

- Carefully place paths and roadways to maintain soil connections. Habitat fragmentation affects soils too. This is particularly true for the slow migration of fungi, microbes, and macroinvertebrates who can not travel across paved or compacted areas of soil.
- Fragmentation can create unique conditions that lead to distinct soil habitats that contribute to overall habitat and species diversity, but more often creates less resilient soil communities.



## PRIVATELY OWNED FORESTS KEYSTONES IN THE COMMUNITY

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Monitor and  
respond  
to forest  
changes



Invest in soils  
as underground  
private equity  
with myriad  
public benefits



Connect forest  
health and  
resilience with  
local community  
and economic  
development

Privately-owned forests in Massachusetts face pressures from many sides. They also provide significant benefits to their communities, including ecosystem benefits (water quality, air quality, flood mitigation, regional cooling, habitat, carbon storage and sequestration, and many other benefits). In some cases, they also provide benefits such as recreational access, natural beauty, support for mental health, forest products (food, medicine, lumber), and local economic development from commercial and recreational activities. As of 2017, approximately 63% of all forests in Massachusetts were privately owned, with the vast majority of private acres being family forests<sup>26</sup>. Therefore, privately-owned forests play a critical role in supporting ecological and community climate resilience.

Many private forest owners are deeply invested in caring for their land, including concerns about climate change. Programs such as the Chapter 61 Forest Tax Program<sup>27</sup> and the Forest Stewardship Program<sup>28</sup> were created to provide incentives and support for private forest owners to maintain their land in forest, rather than converting it to commercial or housing development or agriculture. Chapter 61 designation comes with certain requirements for timber production or recreational access, in exchange for a lowered tax rate. The Forest Stewardship Program is designed to support landowners in protecting the intrinsic ecosystem values of their woodlands, whether or not they harvest. The historical emphasis on the productive values of forests is starting to give way to a more holistic understanding of the many benefits that forests provide, especially in the context of climate change (see e.g. Our Connection to the Global Forest).

At the same time, existing regulatory structures and tax incentives often create challenges to ensuring that private forest stewardship and protection can be a top priority. As family forests change hands over generations, inheritance and estate taxes combined with increasing economic value of land in conversion for development can become barriers to maintaining these forests as forests. Whether for housing, solar development (an increasingly common theme in Massachusetts in recent years), or other land uses, forest conversion on a large scale generates large carbon emissions and places increasing pressure on the remaining forests to continue to provide those critical ecosystem services and benefits described above. With all this in mind, what's a private forest owner to do?



## Monitor and respond to changes in the forest

Active care of private forest lands contributes significantly to the health and resilience of the region as a whole. Depending on an owner's context, this could be a straightforward part of daily life, or this could be a significant challenge. For example, an individual owner protecting 80 acres of forest through the Massachusetts Chapter 61 Forest Tax Program, working a full-time job, with little or no help to engage in regular forest monitoring, faces barriers of time and people-power that a large private commercial forestry company may not face. According to the Family Forest Research Center (a collaborative initiative between the University of Massachusetts Amherst, Michigan State University, and the USDA Forest Service), 53% of family forest land is owned by people with 100 or more acres, 1 in 3 family forest owners is 65 years of age or older, and owners' primary reasons for maintaining their land range from beauty/scenery to privacy, nature protection, and to pass land along to future generations<sup>29</sup>.

## ACTIONS

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### Protect

- Develop and strengthen networks and partnerships to support family forest owners in monitoring and caring for their properties, and advocating for beneficial updates to things like taxation structures and policies.
  - Engage or update estate planning to ensure that planning for forest health, resilience, carbon storage/sequestration, and biodiversity continues into future decades and centuries.
- Monitor the forest proactively to understand existing dynamics and observe changes, including potential threats and opportunities to protect existing mature trees, carbon stocks, and native forest biodiversity, and to increase resilience.
  - Develop and document clear, flexible, and replicable methods for observing and cataloging existing conditions and changes over time.
- Connect existing conditions and observed changes to historical dynamics and influences. Work with this whole picture to determine what's needed (see Principle 6, p.13 for further consideration).
  - Conduct assessments of forest vulnerabilities and opportunities to increase ecosystem resilience by protecting qualities such as carbon storage and sequestration, native forest habitat biodiversity, and connectivity, and recovery after disturbance.
- Deepen and transform our relationship with trees and forests (Core Principle 3), and learn about how trees communicate and interact.
- Incorporate protection of native forest biodiversity and habitat management into forest care frameworks and approaches.
  - For instance, leaving some dead wood in the forest can be highly beneficial for species biodiversity and habitat.

## Restore

- Work to develop old-growth forest characteristics in existing and newly planted forests. See MassWoods, Restoring Old Growth Forest.
- When necessary, harvest and removal of dead trees can also create opportunities for the forest understory to regenerate and adapt to climate change, while providing materials that can sustainably support economic and cultural life, including traditional Tribal practices and building techniques.

## Manage Better

- Coordinate with municipal agents and utility companies around utility line clearing to prevent/eradicate/isolate invasive plant species and create borders of resilient native and climate-adapted species to protect adjacent forests, where applicable.
- Where private land is publicly-accessible, install trailhead signage to educate users about pests and invasive species, inviting them to collaborate in the process of early identification.
  - Incorporate digital tools such as QR codes that link to pages where people can share their findings (including locations, images, and other notes), connect with additional resources, and learn more about the forest.
- Address invasive species issues as soon as possible.



## Invest in soils as private equity with myriad public benefits

Caring for forest soils on private lands also holds the potential for major returns on investment. The exceptional functions performed by forest soils are largely a result of the symbiotic relationship between soils, trees, shrubs, and soil organisms. Healthy trees and understory plants work together to pump sugars and other products of photosynthesis into the soils. This ‘investment’ feeds soil organisms and contributes to the formation of soil carbon. Thus, protecting, maintaining and restoring/regenerating soil health in forests requires protecting existing tree cover wherever possible, and can be enhanced in lands where trees have been cut by adding soil organic carbon to the soil directly. With so much of our region’s forested lands in private hands (over 60%), strategic action in this sector has the potential for significant benefits across scales. As pressures from forces like climate change, development, and poor forestry practices cause forest loss and degradation, forest soils can be powerful places to intervene to increase ecosystem health and climate resilience.

## ACTIONS

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### Protect

- Protect, maintain and regenerate forest soils across all private ownership contexts. Protect existing trees whenever possible, so as to protect existing soils and soil carbon.

### Restore

- When planting or replanting, plant native and climate-adapted species of canopy and understory trees and shrub species, especially in disturbed areas after a harvest or natural disaster.

*There is a growing body of evidence that additions of responsibly sourced rock powders and biochar can increase carbon sequestration and improve plant health in both forests and croplands. Test soils to determine deficiencies, focusing amendments in naturally disturbed or harvest areas.*

## Manage Better

- If tree cutting is occurring, maintain cover on the forest floor by retaining slash and leaf litter where possible. Retaining the slash restores soil nutrients and carbon and prevents erosion. Preventing erosion prevents loss of soil carbon.
- In areas where large quantities of debris present a fire hazard or where leaf litter decomposition is accelerated (i.e. where there are jumping worms), spread wood chips.
- Prevent and repair erosion, especially during and after forest harvests or construction. Implement required and recommended BMP's from the Massachusetts Forestry Best Management Practices Manual. Use slash and chips to form berms on contour to capture more leaf litter.



### Connect forest health and resilience with local community health and economic development

Forests are integral parts of community life across the Commonwealth. Forests support our activities and economies through supporting the continuation of traditional and current Indigenous cultural practices, by providing ecosystem benefits (improved water quality, localized cooling, local and regional water budgets, reduced erosion and storm damage, wind breaks, biodiversity, local, regional, and global climate regulation, and avoiding hard infrastructure costs), materials (such as timber for construction), and cultural assets that generate economic, public health, food supply and social returns (recreation, hunting and fishing, and tourism). Forest health is essential to the sustainability and viability of local economies and societies for all these reasons and more. However, regional and global trends – both ecological and economic – have contributed to dynamics that are sometimes at odds with the interests of small-scale family forest management, Indigenous stewardship, and other priorities that contribute to diverse and resilient communities. Where community values are invested in maintaining a thriving local economy with strong relationships to the forest, strategies that prioritize Indigenous and general public access to natural lands, build strong local relationships, and support continued economic contributions from family forests can help to ensure that forests remain a long-term priority and grow in resilience along the way.

## ACTIONS

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### Protect

- Actively protect more mature stands of trees within your property to ensure protection of existing carbon stores and growing carbon sequestration over time and greater forest patch connectivity over space.

Advocate for changes in the Massachusetts Chapter 61 program to enable forest owners to receive the same or greater tax benefits for protecting existing forests (i.e. let existing trees continue to grow) as for intermittent logging of forests.

### Restore

- Encourage sustainable forms of ecological management with local economic benefits, such as deer hunting to manage excessive browse and provide food for local food pantries or other local partners helping to address hunger.
- Work with local and regional partners to increase forest access and participatory forest care for residents, Indigenous Tribal stewards, youth (e.g. through school engagement and educational experiences), and other stakeholders.

## Manage Better

- If you do harvest some of your forest, connect to opportunities for local milling, micro-logging, culturally relevant harvesting in partnership with Indigenous stewards, and other small-scale forestry activities that minimize impacts and maximize forest health and regeneration.
- Collaborate with municipal, nonprofit, and other private partners to articulate and communicate the benefits provided by family forests and private trees – e.g. ecosystem benefits, cultural and recreational attractions.
  - For instance, a municipality or other entity may be interested in pursuing Arboretum Accreditation<sup>30</sup> for a culturally valuable collection of trees. Through this process, “feature trees” on private properties could be included, highlighting their significance in the community.

### CASE STUDY:

## MASSAUDUBON'S ARCADIA WILDLIFE SANCTUARY FLOODPLAIN FOREST RESTORATION PROJECT<sup>31</sup>

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An example of this Climate-Smart Forestry in action is a recent floodplain forest restoration project in the Arcadia Wildlife Sanctuary in Northampton, which was a project conducted through the MassAudubon Climate-Smart Forestry program. Volunteers planted ~1500 trees in an effort to restore the floodplain forest. Restoration of this forest will offer multiple co-benefits including flood water management, carbon sequestration, as well as increased habitat. Additionally, by planting species that currently grow further south, northward species migration is being facilitated, which protects these vital forests from climate stress, as well as maintaining the carbon sink they provide. Proactively selecting more southern yet high ecological value species for planting may also reduce the chance that invasive species will outcompete the planted species.

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# MUNICIPAL HEALTHY LANDS AND HEALTHY PEOPLE



Regenerate  
forest health and  
climate resilience  
on municipal  
lands



Strengthen and  
grow community  
connection to enable  
sustained collective  
action



Connect local policies  
and regulatory  
frameworks to promote  
forest stewardship

Municipal parks, paths, tree-lined streets, conservation lands, and other public trees are important community resources that provide a wealth of benefits to residents, visitors, and entire ecosystems. Whether owned outright or protected through legal agreements such as Conservation Restrictions (CR), municipal forests and trees relieve pressure on infrastructure systems by managing things like stormwater and water quality, provide shading and cooling at street-level all the way to the regional scale, and are key elements of local recreation, public health, and community character.

Towns and cities are increasingly recognizing the myriad benefits that trees and forests provide, and understanding the magnitude of those benefits in terms of things like costs of community services<sup>32</sup>, benefits to public health and safety<sup>33</sup>, and attractiveness that contributes to local economic activity such as tourism and increasing foot traffic in commercial areas<sup>34</sup>. Street trees and municipally-owned forests often face unique challenges, as well, due to factors such as soil compaction and roadway pollution in developed areas, or impacts from high public usage of local conservation areas (especially during the COVID-19 pandemic).

Staff capacity and funding to properly maintain municipal forests and trees may be insufficient today, and climate change presents additional needs that require further investments of time and money. Street trees frequently require management to accommodate utilities and public works, as well as private citizen requests to protect property from potential damage, including pruning or removal. Tree replacement requires further consideration to ensure that new trees are planted in numbers and locations that will avoid future issues and enable trees to survive and thrive.

When it comes to larger forested areas such as municipally-owned conservation lands and open spaces, successful management often requires the help of local volunteers. Many communities engage in cleanup days, work with groups of residents and students to do trail maintenance and invasive species removal, and undertake community engagement projects to reduce erosion and improve stream crossings, for instance. As the effects of climate change become more evident in these spaces, many cities and towns are interested in taking additional steps to manage and protect their forests and trees, but may be limited by the same realities of staff capacity and funding discussed above.



## Regenerate forest health and climate resilience on municipal land

Municipal lands provide many opportunities to protect and regenerate forest health while enhancing the capacity of natural landscapes to provide ecosystem benefits now and for future generations. In developed areas, tree health can be enhanced through consistent monitoring and coordinated responses to evolving conditions, including threats from things like pests and drought (see Worcester Tree Initiative Case Study, p.22). Potential locations for tree planting and forest expansion in developed areas include the grounds around municipal facilities, roadsides and medians along rights-of-way, public parks and paths. When it comes to forested conservation lands, partnerships are key to expanding protected areas (see the following Strategy for further discussion). Municipalities can help their existing forests by assessing vulnerabilities and opportunities for health, assisting adaptation through thoughtful intervention, and establishing ongoing monitoring and management strategies informed by climate projections and direct observations.

## ACTIONS

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### Protect

- Work with community members and adjacent landowners to protect more mature forested lands from development and other disruptions through direct purchase, regulation of development, or easements. (See Appendix A for tools and resources related to cultural easements)
- Share educational information with the community regarding the importance of mature stands of trees and the benefits they provide to the municipality.
- Conduct assessments of municipal forest vulnerabilities and opportunities to increase ecosystem resilience through management.
  - Opportunities can include things like protection and enhancement of carbon storage and sequestration capacities, biodiversity and connectivity, and recovery after disturbance, among others (see Forests, Trees, and Climate Change, p.9).
  - Vulnerabilities might include areas prone to erosion or high heat, stressors from things such as road salts, vehicle combustion, gas pipeline leaks, groundwater contamination, soil compaction or contamination, or species vulnerability to pests, for instance.
- Develop and document clear, flexible, and replicable methods for observing and cataloging existing forest composition and developing goals, to enable planning and monitoring for strategic diversity over time.

### Restore

- In degraded areas, such as urbanized areas, remnant monoculture tree plantations, or areas cleared for land development, use these areas to increase species diversity (especially adjacent to existing forests) to bolster overall forest resilience to influences such as pests and climate change.
  - Pick plant species to support long term health and protection of nearby forested land.
- Work with local and regional partners to increase forest access and participatory forest care for residents, Indigenous Tribal stewards, youth (e.g. through school engagement and educational experiences), and other stakeholders.



## Restore (continued)

- Plan and plant for strategic connectivity, valuing marginal lands (e.g. vacant lots, parking lots, roadside shoulders, median strips, etc.) for their potential to contribute to canopy cover at the site level all the way up to the landscape scale. Prioritize new tree planting where this will have the greatest benefits for existing forests, community health, climate resilience, and landscape-scale connectivity.

## Manage Better

- Plant new trees with climate adaptation in mind, selecting native and climate tracking species well-suited to developed areas<sup>35</sup>. Some (often overlapping) planting locations to consider include:
  - Areas where climate-vulnerable populations (such as elderly residents, people with reduced mobility, young children, or people who lack access to air conditioning) are concentrated;
  - High-heat areas where trees can provide valuable shading and cooling;
  - Flood-prone areas where trees can help to manage stormwater;
  - Areas where existing canopy is relatively less dense or robust.



### Strengthen and grow community connections to enable sustained collective action

From street trees to large areas of conservation land, forging partnerships with other local and regional stakeholders is critical to ensuring the long-term health and resilience of forested landscapes (and in turn, the communities they support and nourish). Ensuring the continued health and integrity of undisturbed natural systems, restoring and regenerating areas facing challenges, expanding canopy cover, and increasing the extent of protected areas requires simultaneously increasing effective tree and forest care capacity, or else the benefits of these efforts will not be sustainable over time. Working with community and local government partners as well as other stakeholders to expand capacity for tree and forest care is a key strategy for making this possible.

## ACTIONS

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### Protect

- Encourage, sustain, and work to create direct relationships with the current school curriculum and youth engagement initiatives to promote values and develop capabilities in younger generations.
- Coordinate with private landowners and utility companies around utility line clearing to prevent/eradicate/isolate invasive species and create borders of resilient native and climate-adapted species to protect adjacent forests from invasion, where applicable.
- Partner with local nonprofits and residents to promote general tree education, community tree care, and stewardship. See case study on p.33 for an example from the Worcester Tree Initiative.

## Restore

- Coordinate with private landowners and utility companies around utility line clearing to prevent/eradicate/isolate invasive plant species and create borders of resilient native and climate-adapted species to protect adjacent forests from invasion, where applicable.
- Collaborate with local and regional Indigenous stewards to enable partnerships and restore Indigenous Peoples' access to culturally important locations and natural materials for building, making, and otherwise practicing Indigenous lifeways. (See Appendix A for resources on cultural easements)
  - As an example, ash bark is used to make canoes, baskets, and other items through traditional means, and ash trees are facing threats from pests like the Emerald Ash Borer. Work with local Indigenous cultural stewards to provide ash trees to local Tribes when trees are cut for pest control.

Municipal partnerships with Indigenous stewards can be examples of resilience through reciprocity

- (see Principle 3), expanding tree and forest care capacity for municipalities and ensuring access to ancestral homelands and natural and cultural resources for Indigenous communities while encouraging mutual learning and relationship building.

## Manage Better

- Encourage and facilitate community participation in pest and invasive species monitoring through education, outreach and engagement.
  - Install signage at conservation areas and along popular pedestrian routes in developed areas to educate users about pests and invasive species and what to do about them, inviting people to collaborate in the process of early detection.
  - Incorporate digital tools such as QR codes that link to pages where people can share their findings (including locations, images, and other notes), connect with additional resources, and learn more about the forest.
  - Incorporate information on neighborhood tree and forest care into “welcome packet” materials for new homeowners. This can help to educate and involve new residents who may be new to home ownership and unfamiliar with the local forest or opportunities for tree care on their property.
  - Host local events to share effective approaches for identifying and managing specific pests and invasive species of concern locally. “Train the trainers” models may be effective for increasing the reach of these engagements (see Sudbury Valley Trustees Case Study, p.40 for more).
- Coordinate across Town departments to ensure the sustainable expansion and maintenance of local forests and tree canopy.
  - Map out relevant departments and their current relationship to tree care and maintenance in the community.
  - Identify shared maintenance opportunities (this includes but is not limited to a shared maintenance contract) across municipal departments to ensure that urban forests and trees continue to thrive.
- When private forest owners have decided to harvest their forest, provide guidance on how they can connect with opportunities for local milling, micro-logging, culturally relevant harvesting, and other sustainable small-scale forestry that minimizes impacts and maximizes forest health and regeneration, and if possible, in partnership with Indigenous stewards.
- Explore the potential to create immersive forest experiences across different land uses and contexts. This can encourage new experiences of relationship to the forest, while also promoting community participation, mental and physical health, etc.



## Connect local policies and regulatory frameworks to promote tree and forest care

The relationship between development, property values, forest conservation, and tree preservation/planting is especially nuanced in the municipal context. Municipalities rely on property taxes to fund operations, and are constantly balancing many competing priorities, including protection of natural areas and resources. New development may increase property values and thus contributions to municipal income, however, it also increases costs associated with infrastructure, schools, and other civic services. Development can also cause ecosystems to suffer, leading to a deterioration in ecosystem benefits provided. While ecosystem benefits are rarely quantified in cost-benefit analyses, they provide tangible savings in the form of reduced infrastructure and municipal service costs, beneficial contributions to public health and local culture, revenues from recreation and tourism, carbon storage and sequestration, and more. At the same time, housing development is much-needed in many Massachusetts communities, particularly for affordable housing, as demand far outstrips current supply.

The challenge of this situation is to reconcile needs such as housing and funding for municipal operations with the pressures that increasing development and property values place on natural lands. Unprotected forests are often prime candidates for new development, with private forest owners facing economic realities that incentivize sale for development over conservation (see the Privately-Owned Forests Guide), and urban greening can lead to displacement as a result of gentrification<sup>36</sup>. Further, where development proceeds without regard for ecosystem regeneration, the forests and trees that remain experience even more stressors and threats than they did before development, including increasing fragmentation, soil loss, erosion and compaction, urban heat island effects, and others.

Municipalities have an important opportunity to utilize their unique position to increase communication among stakeholders, including neighborhood residents, private landowners, local leaders and regional/state policymakers. The potential exists to do so in ways that paint the full picture of the effects of current frameworks and regulations across stakeholder groups and jurisdictions, clarifying areas where policies and actions have been working at odds with stated goals and priorities such as climate action, and where they can be reinforced to continue working effectively in the context of climate change. By facilitating relationships and conversations that shed light on the workings of the whole system, solutions can emerge to address shared priorities such as nature protection, climate resilience including protection of existing tree and forest carbon stocks and native forest biodiversity, affordability, and community health in ways that create alignment and build capacity to respond collectively to new challenges in the future.

## ACTIONS

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### Protect

- Continue to seek additional funding and advocate for expanded staff capacity to support ongoing tree and forest care, community outreach, and stakeholder engagement.
  - Establish a local Tree Fund, if one does not already exist. Such Funds can be set up to receive financial contributions in the form of donations from residents or institutional funders, fees for tree removal, fines for violations of local regulations, and/or municipal budget allocations, among other sources. Those fees can then be utilized for local tree planting and long-term care<sup>37</sup>.
  - Advocate for the creation and continuation of long-term funding streams at the state level to support work that enhances forest and tree resilience, such as the MA Municipal Vulnerability Preparedness (MVP) Program<sup>38</sup> (which funded the creation of these Guides), or the MA Department of Conservation and Recreation's Urban and Community Forestry Challenge Grants<sup>39</sup>.
  - Expand and strengthen partnerships across the community to leverage the potential for coordinated policy action and successful grant applications through existing programs. This strategy may also support existing staff capacity or enable new roles to be created as needs are identified.
- Adopt or strengthen existing tree and forest protection and natural resources protection provisions within local bylaws and regulations.
  - Prohibit clear-cutting of sites for construction. Require preservation of trees over 6" diameter breast height (DBH) and replacement of any smaller trees removed at a ratio of >1:1, or in direct proportion to the DBH lost.
  - Ensure that trees marked for preservation are fully protected during and after construction, such as by installation of protective temporary fencing during construction at least as far away from the tree trunk as the drip line, if not further, to ensure that the tree trunk, branches and root zone are not damaged.
  - Introduce flexibility in dimensional regulations and parking requirements to facilitate tree retention and long-term survival and health post-construction.
- Require replacement of hazard trees and trees lost to damage, disease, or development at a ratio greater than 1:1, or in direct proportion to the DBH lost.
- Develop standards for aligning replacement requirements with maintenance and regeneration of ecosystem services lost from tree removal.
- Integrate climate resilience considerations (such as species suitability and ability to provide shade) into all landscaping requirements.
- Adopt or allow Natural Resources Protection Zoning (or other forms of conservation development) for subdivision development by right. Provide incentives and guidance for NRPZ implementation.

### Restore

- Convene local and regional stakeholders to advocate at the state level for policy reforms that align economic incentives (such as property and inheritance taxes) with conservation and natural resources protection.

## Manage Better

- Align regulations and taxation structures with the goal of minimizing impervious surfaces and improving ecosystem health, including water quality, soil health, and other aspects of resilient ecological functioning.
  - Require implementation of Low-Impact Development (LID) practices to limit tree cutting, increase overall ecosystem functioning, and encourage tree health and resilience. Areas lacking canopy cover should have a specific reason for its exclusion and a specific added value to justify its absence over and above maintenance/convenience.
  - Reduce required/allowed width of impervious corridors to maximize canopy shading and connectivity. For instance, reducing the maximum allowable width of roadways (including for subdivisions), and requiring direct traffic counts or assessments of local context in determining roadway design, rather than adherence to external standards or requiring universal curbing, can strengthen Zoning Bylaws and Subdivision Rules and Regulations toward this goal.
- Explore mechanisms such as impervious surface and stormwater taxes, whereby properties that contribute disproportionately to impervious cover are taxed at a higher rate than areas that facilitate infiltration, with proceeds going toward a Tree Fund (discussed above) and/or other ecological and community nature-based resilience efforts. This can further encourage LID adoption and provide sustainable funding for ongoing improvements to natural systems in developed areas.

## CASE STUDY:

### THE NATIVE LAND CONSERVANCY AND THE TOWN OF DENNIS CULTURAL RESPECT AGREEMENT<sup>40</sup>

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The Cultural Respect Agreement between the Dennis Conservation Land Trust (DCLT) and the Native Land Conservancy (NLC) was first established in 2016, providing formal access to 250 acres of the marshland and estuary owned by the DCLT. This agreement was “the first of its kind east of the Mississippi river,” and represented a commitment to respect Indigenous culture and ensure ongoing access and relationship to these lands.

In the fall of 2021, as the initial agreement neared the end of its term, the two organizations began discussions around how their work together might be strengthened. In affirmation of the mutual significance of this effort, the DCLT Board approved a renewed Cultural Respect Agreement that ensured access to all 640 acres of DCLT lands, forever.

NLC Director Ramona Peters noted that “A Cultural Respect Easement is the closest expression of land repatriation to Indigenous People achieved without an actual transfer of deed. It offers assurance for us to safely access areas of our ancestral homelands to exercise spiritual and cultural practices... especially in areas where our ancestors prayed, danced, toiled, lived and were buried.”

For more details on agreements like this, please refer to Appendix A at the end of this report.

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## REGIONAL + STATE COLLABORATIVE FOREST MANAGEMENT

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Integrate forest resilience into paradigms and practices of forest care



Promote regional forest health and ecological climate resilience on private and protected lands



Strengthen regional partnerships to align policy and planning with forest protection and expansion

Many perspectives and priorities emerge from the nested levels of neighborhoods, private forests, and municipal lands to come into play at the regional level. In addition, State Agencies, Tribal Governments, regional land trusts, watershed associations, conservation organizations, and Regional Conservation Partnerships are some of the regionally-focused groups that bring further layers of governance structures, ecological frameworks and conditions, and values and goals, as well as resources to take action, to the picture of regional forest and tree care. This picture is complex and full of potential, since actions at the regional level can influence policies and practices across large areas of the landscape, and can have meaningful impacts on neighborhoods, private forests, and municipal lands in the process.

Regional forest stakeholders are often large landowners themselves, such as the Commonwealth of Massachusetts, or a number of statewide conservation organizations. These entities not only steward their own lands, but often oversee programs to train and educate other forest managers and/or provide resources (tax incentives, direct funding, technical assistance) to support forest protection and management beyond their own properties. In the Commonwealth, there are a number of laws, policies, and programs that exist at the state level which are intended to guide or regulate the treatment of forests to support long-term resilience to climate change, including carbon storage and sequestration in forests and soils on public and private lands. Other programs exist that are not intended to affect forests directly, but nonetheless have impacts, such as renewable energy incentives and regulations on development. Many of these laws and programs still see forests as resources to be used, rather than living systems to participate in. Alternatively, these guides encourage a living systems view of our relationships to forests. Some resources that also promote a living systems perspective include the MA Resilient Lands Initiative (2020), the MA Healthy Soils Action Plan (2021) and the MA Decarbonization Roadmap (2020).

Regional actors are also often advocates for policy innovation and change, including Tribal Government and nonprofit advocacy for Indigenous land access and stewardship rights (see Native Land Conservancy Case Study, p.37). The Principles outlined in these Guides (see p.11) emphasize a holistic view of trees and forest within our ecosystems and the value of holding existing forest dear (protecting and restoring areas of trees). The Principles also identify the importance of diversity and connectivity, both in ecological and social terms, underscoring the importance of building bridges between people who have different understandings of forests and what is needed to protect their health and resilience. As previously noted in these Guides, partnerships with Indigenous stewards can be examples of resilience through reciprocity (see Principle 3, p.14), expanding tree and forest care capacity throughout the landscape and ensuring access to ancestral homelands and natural and cultural resources for Indigenous communities while encouraging mutual learning and relationship building.



## Promote regional forest health and ecological climate resilience on private and protected lands

The focus of the strategies outlined below is on actions that can be adopted and implemented directly on lands that are owned and/or managed by regional actors, from individual sites all the way to the landscape scale. Conservation lands, particularly those that are open to the public, may experience challenges associated with disturbance, removal or introduction of plant and soil matter, debris, litter, erosion, and other impacts that are difficult to prevent yet can have long-term effects on the health of the ecosystem. At the same time, these lands are powerful connectors of people to place, and provide important benefits to public health and well-being, as has been clearly demonstrated during the COVID-19 pandemic and in various academic studies. In addition to conservation lands, many other opportunities exist at the regional scale, including in state recreational areas and on lands owned by MassDOT, as well as lands owned for other purposes, such as campuses and school properties, among others. Involving public users and regional entities in tree and forest care through education, outreach, and sharing of values and goals can support understanding and empowerment to contribute to forest health and resilience in places that people know and love.

### ACTIONS

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#### Protect

- Manage existing forests for protection of carbon stocks and sequestration capacity to support the transition toward old growth size and characteristic<sup>41</sup>.
  - Develop and document clear, flexible, and replicable methods for observing and cataloging existing forest composition to assist in these actions.
- Monitor the forest proactively to understand evolving dynamics and observe changes, including potential threats and opportunities to increase resilience.
  - Include monitoring of tree canopy, understory, and forest soils to understand the full picture of ecological forest resilience and opportunities to strengthen it, as well as to identify emerging threats and to adjust ongoing responses to existing threats.
- Involve members of the community in protecting, maintaining, and restoring/regenerating forest health through public programming, education, and outreach (see Case Study below for one example from the project region).

#### Restore

- Where protected land is publicly-accessible, install trail signage to educate users about pests and invasive species, inviting them to collaborate in the process of early identification.
  - Incorporate digital tools such as QR codes that link to pages where people can share their findings (including locations, images, and other notes), connect with additional resources, and learn about the forest.
- Incorporate restoration of native forest biodiversity into forest care frameworks and approaches.
  - Leaving dead wood in the forest can be highly beneficial for species biodiversity and habitat. This includes protecting large trees, trees in decline or old age, changing roadside tree management from removal to safety pruning to retain snags (standing tree trunks) and selectively piling brush as habitat thickets instead of chipping and removing it.
  - At times, some harvest and removal of dead trees can also create opportunities for the forest understory to regenerate, while providing materials that can support economic and cultural life, including traditional Indigenous practices and building techniques.

## Manage better

- Where land is degraded or has been converted from forest, look for opportunities to plant or restore native forest species and increase biodiversity (including native soil biodiversity) such as in parking lots or other transitional landscapes or areas with plantation monocultures, especially adjacent to existing forests to bolster overall forest resilience to the influences of climate change (e.g. increasing heat, pests and disease).

### CASE STUDY: SUDBURY VALLEY TRUSTEES

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Sudbury Valley Trustees is a non-profit operating in a 36 community region between Boston and Worcester whose mission is the protection of natural areas and farmland for wildlife and people. SVT seeks to fulfill this mission by focusing their work in three areas: land protection, land stewardship, and community engagement. SVT provides leadership, support and resources for numerous land protection efforts throughout their 36 community operating region, including coordinating the MetroWest Conservation Alliance, a Regional Conservation Partnership in Central Massachusetts<sup>42</sup>.

As part of the Merrimack River watershed, protection of this land supports preservation of water quality, and ensures that development of this land would not further degrade the water quality of the Merrimack, which is identified by American Rivers as one of the 10 most threatened rivers in the United States. Improvement of stream crossings through volunteer building of bridges and boardwalks was one management strategy employed to preserve stream integrity and water quality, while working with existing usage patterns.

Stewardship is a significant component of SVT's work, and the 40 Caves tour highlighted this with their effort to control and remove invasive species through their "Weed Warriors" volunteer program. This program trains volunteers in the proper identification and removal of targeted invasive species, an effort that was able to continue even through the COVID-19 pandemic, and has been expanded as a 'train the trainers' type program that helps to further the reach and effectiveness of invasive species management in the region.



### Integrate forest resilience into paradigms and practices for forest care

Our current forest use paradigm is to take more from forest systems than they can sustainably bear. The Principles developed by the Forest Task Group remind us to see ourselves as part of a living forest ecosystem, to take the long view when considering management activities, and to protect existing forests and connect them to other forested landscapes at the regional level. Working to alleviate the stressors that impact trees and forests and taking into consideration these Principles points the way to a paradigm of forest care that suggests actions such as collaborating with Native American communities, and minimizing impacts of tree and forest cutting. Beyond these initial ideas, we can begin to ask, what does the forest need? How do we provide what the forest needs? And to be open to new understandings of what this can look like beyond the knowledge we may have today. (see Privately-Owned Forests Guide for further discussion.)

## ACTIONS

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### Protect

- Examine and share the best available science about forests and forest carbon stocks and the role of native forest biodiversity.
- Promote and expand existing programs directed at increasing knowledge and capacity among those managing and caring for forests and trees, such as DCR's Climate Forestry Stewardship Training Program, and Forest Climate Resilience (municipal) Programs.



## Protect (continued)

- Build relationships with local Tribes and Indigenous cultural stewards in order to build an understanding of Indigenous perspectives on forest care over the long term.
- Create land management policies that focus on long term protection of forests and forest resources with special attention to larger and more mature stands of trees.

## Restore

- Plant climate adapted species of canopy and understory trees and shrubs, especially in disturbed areas after a harvest or natural disaster.
  - Promptly revegetate sites after disturbance where applicable, restoring disturbed sites with a diversity of future climate-adapted species and protecting seedlings to maturity.
- There is a growing body of evidence that additions of rock powders and biochar (when sourced through non-forest-degrading practices) can increase carbon sequestration and improve plant health in both forests and croplands<sup>43</sup>. Test soils to determine deficiencies, focusing amendments in naturally disturbed or harvest areas<sup>44</sup>.

## Manage Better

- Where forest harvesting is occurring, maintain no-harvest reserve areas on sites that are healthy and resilient, with high carbon density, so that the forest is allowed to continue to grow and trees can reach new size classes in these locations.
  - Where harvesting occurs, shift from high-intensity to low- and medium-intensity harvest, leaving more trees (including large, high-value trees) standing and lengthening rotation cycles to increase soil carbon storage and regeneration potential.

Maintain cover on the forest floor by retaining slash and leaf litter where possible. Most of the nutrients in trees are located in the small branches and leaves. Leaving them on the site restores nutrients and carbon to the soil and helps prevent erosion and soil carbon loss.

- In areas where large quantities of debris present a fire hazard or where leaf litter decomposition is accelerated (i.e. where there are jumping worms), spread wood chips and consider planting trees such as oak that have leaf litter that deters Asian jumping worms.
- Prevent and repair erosion and sedimentation, especially during and after forest harvests or construction. Implement required and recommended BMP's on this topic from the Massachusetts Forestry Best Management Practices Manual. Use slash and chips to form berms on contour to capture more leaf litter.

When private forest owners have decided to harvest their forest, provide guidance on how they can connect with opportunities for local milling, micro-logging, culturally relevant harvesting for Indigenous communities, and other small-scale forestry that minimizes impacts and maximizes forest health and regeneration, in partnership with Indigenous stewards.



## Strengthen regional partnerships to align policy and planning with forest protection and expansion

The relationship between development, property values, and forest conservation and protection is complex and has wide-ranging implications at the regional level. Municipalities rely on property taxes to fund operations, creating incentives to develop land in ways that keep associated costs to a minimum; private family forest owners often face financial pressures that incentivize sale of their land for renewable energy or housing development. Development can also cause ecosystems to suffer, leading to a deterioration in ecosystem benefits provided. While ecosystem benefits are seldom quantified, they provide tangible savings in the form of reduced infrastructure and municipal services costs, beneficial contributions to public health and regional culture, revenues from recreation and tourism, and more.

At the same time, housing development is much-needed in many Massachusetts communities, particularly for affordable housing, as demand far outstrips current supply. To add further to this mix, low-density development that results in forest conversion is the leading cause of forest loss in Massachusetts today<sup>45</sup>.

Countless studies, policy recommendations, and advocacy efforts encourage expanding forest protection, avoiding conversion to non-forest land cover, and increasing landscape-scale biodiversity and connectivity as key strategies for climate resilience and community health. Strategic partnerships and collaboration at the regional level have enormous potential to support these broadly-shared priorities, especially when combined with stakeholder advocacy around the complementary toolkit of Smart Growth strategies. Smart Growth is an approach to community development emphasizing compact, walkable, and transit-oriented design that reduces impervious surfaces and enables things like affordable housing while also protecting forests and other ecosystems for people and wildlife. For instance, the MA Resilient Lands Initiative (RLI) calls for “No Net Loss of Forests” as a commitment to Smart Growth in tandem with expansion of forest and farmland protection, rooted in a focus on equity and inclusion of people who are traditionally under-represented in planning and decision-making processes<sup>46</sup>.

## ACTIONS

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### Protect

- Strengthen or develop regional stakeholder networks including governments (local, state, Tribal), land trusts, conservation organizations, and other nonprofit groups who can support permanent protection and climate-beneficial stewardship of forests.
  - For example, Regional Conservation Partnerships like the MetroWest Conservation Partnership (see Sudbury Valley Trustees Case Study, p.40) often bring together municipal leaders, state and federal agencies, academic institutions, conservation organizations, and other stakeholders to protect larger landscapes<sup>47</sup>. The RCP model can facilitate stakeholder collaboration and understanding of the full picture of priorities and goals to find alignment and identify opportunities to move forward together.
  - At the state level, the MA Resilient Lands Initiative and MA Decarbonization Roadmap emphasize that forest protection and expansion are critical to statewide climate change mitigation and resilience.
- By examining the full suite of policies and goals affecting forests, not just those that are directly intended to do so, advocates and decision-makers can identify opportunities to create alignment to reconcile multiple priorities through collective action. This requires expanding common conceptions of who is a stakeholder in policy and decision-making, bringing in diverse perspectives and connecting them to the whole of the system at work (see Principles 2 and 4).
  - This expansion in thinking could include Indigenous Peoples and local environmental justice and climate vulnerable communities, and it could include a shift in perspective that encompasses viewing forests as stakeholders, not simply resources to be extracted for human use. Considering the question, “What does the forest want?” may lead to greater success in identifying and implementing approaches that sustain biodiversity, richly functional and complex forests, existing carbon stocks, and the substantial capacity that forests have to pump carbon out of the atmosphere and store it in soil and biomass, leading to greater resilience for the whole web of life including humans.

### Manage Better

- Expand advocacy around Smart Growth in addition to direct forest protection and care/stewardship. This can include pursuing widespread adoption of strategies such as Natural Resource Protection Zoning at the municipal level, and adoption of policies to incentivize renewable energy development on rooftops, parking lots, and brownfields over conversion of existing forests and farmlands, among others.
- Advocate for alignment between state-level policies, regulations, and incentive programs aimed at addressing different priorities.
  - For instance, the Chapter 61 Forest Tax Program requires harvesting in order for a landowner’s status in the program to be maintained, whether or not an individual landowner wants or needs to harvest. Part of the rationale is that these lands are providing local economic benefits, yet the ecosystem services and other public benefits they provide are not taken into consideration. The current Chapter 61 Forest Tax Program could be modified to include tax reduction credits for maintaining existing forest as forest for carbon storage and climate resilience, with no harvesting required in order to obtain the tax credit.
  - Under current rules, should a landowner choose to forego harvesting, other options for tax savings (such as Conservation Restrictions) require the sale or donation of rights to their land, limiting potential future uses and lowering the market value of the land. While this may be a viable option for some, for others this creates a disincentive.

## Our Connection to the Global Forest

Trees and forests live collaborative lives. Our local forest patches are part of a larger Massachusetts/New England/Northeast forest, which in turn is part of a larger North American forest, which is part of a global web of forests on all continents other than Antarctica. The living beings below ground in forest soil, particularly the fungal mycorrhizae, connect individual trees in individual stands, and across forest patches and across even larger forested areas<sup>48</sup>. Living beings who walk, crawl, run, or fly between forest stands, patches, regions, and continents connect forests at each of these scales. Through these soil, terrestrial, and aerial connections, energy, nutrients, seeds, pollen, water, living beings and messages are shared, moved, and transported around and across the local, regional and global web of life. By learning how to learn from, partner with, and steward our local and regional forests, we take important steps in the direction of the Living Forest. As inhabitants of, and stewards for, temperate forests, our role on the global forest stage is significant since, “There is more carbon stored in the world’s temperate and boreal forests combined than in all remaining tropical forests”<sup>49</sup> and the carbon density of Massachusetts forests is particularly high for the New England area.

The global web of life, also known as biodiversity or nature, creates a livable climate and creates balance, connection and complexity. Forests, wetlands and oceans are key carbon banks, constantly pulling carbon out of the atmosphere, working to maintain a livable climate while supporting biodiversity. Forests, including wetland forests, remove more carbon dioxide from the atmosphere than any other land-based ecosystem. In total, land-based ecosystems have been removing approximately 31% of annual greenhouse gas emissions over the past 60 years<sup>50</sup>. The global science and policy world is now explicitly recognizing the central role that the web of life plays in maintaining a livable climate. In June of 2021, the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES), and the U.N.’s Intergovernmental Panel on Climate Change (IPCC) conducted a joint workshop, and released a joint report<sup>51</sup> stating that neither the climate crisis nor the biodiversity emergency can be solved alone. Rather, the biodiversity crash and climate change are two sides of the same coin - the unraveling of the web of life that creates our livable climate. The report specifically states:

*“Only by considering climate and biodiversity as parts of the same complex problem, which also includes the actions and motivations and aspirations of people, can solutions be developed that avoid maladaptation and maximize beneficial outcomes. Seeking such solutions is important if society wants to protect development gains and expedite the move towards a more sustainable, healthy and equitable world for all.”*

In 2022, the IPCC published their 6th Assessment Report<sup>52</sup> stating that, “effective and equitable conservation of approximately 30% to 50% of Earth’s land, freshwater and ocean areas, including current near-natural ecosystems”<sup>53</sup> is required to achieve climate mitigation and adaptation goals. The report also states, “safeguarding biodiversity and ecosystems is fundamental to climate resilient development, in light of the threats climate change poses to them and their roles in adaptation and mitigation”; and, “building the resilience of biodiversity and supporting ecosystem integrity<sup>54</sup> can maintain benefits for people, including livelihoods, human health and well-being and the provision of food, fibre and water, as well as contributing to disaster risk reduction and climate change adaptation and mitigation.” These global reports represent consensus among leading global scientists and are based on their peer-reviewed research conducted across the world. The findings of the 2021 IPBES-IPCC report fed into the 2022 IPCC 6th Assessment Report, which was approved, line by line, by member governments.

A recent study<sup>55</sup> has identified specific forest management practices that will protect and enhance forests' capacity to store carbon and support biodiversity, while also allowing for the harvesting of forest products. The study estimates that by changing forest management practices around the world, forests could hold twice as much carbon as they currently do. The researchers note:

*Mature and old forests generally store more carbon in trees and soil than young forests, and continue to accumulate it over decades to centuries making them the most effective forest-related climate mitigation strategy...A global study of 48 forests of all types found that among "mature multi-aged forests" half the living aboveground carbon was in the largest diameter 1% of trees. A study of six National Forests in Oregon found that trees of 53 cm DBH or greater comprised just 3% of the total stems, but held 43% of the aboveground carbon."*

The study identifies the following forest management strategies to protect and enhance climate mitigation and adaptation and support biodiversity:

### **1. Avoid deforestation and forest degradation and decrease harvest-related carbon losses**

Protect primary/old growth forests and trees (which represent just 7% of forests in the U.S. not including the Tongass National Forest in southeast Alaska)

Where natural forests have been converted to land managed for forest products, extend the harvest intervals so that trees accumulate more carbon and grow larger before being harvested and decrease harvesting intensity so that more large trees are conserved

**2. Eliminate harvesting forests for bioenergy production** because, "Utilizing wood biomass as a substitute for coal increases CO<sub>2</sub> emissions and worsens climate change for many decades or more."

### **3. Conduct full life cycle carbon accounting for wood products and account for the shorter durability of wood products relative to other materials<sup>56</sup>**

"Estimates comparing the carbon benefits of wood products to alternative materials have been found to overestimate the benefit by factors of between 2- and 100-fold by not counting the full life cycle carbon and the shorter durability of wood relative to alternative materials."

"Unharvested forest has a much higher carbon density 120 years later, even when carbon in wood products is summed with the post-harvest carbon storage."

### **4. In fire-prone areas, "change the focus from broadscale thinning to the home ignition zone."**

Contrary to common perceptions, most (more than 60%) of forest fires originate on private property, not in national forests (28%). Hardening the home ignition zone will do more to protect homes while avoiding the increased carbon emissions that result from broadscale thinning. "Broad-scale thinning (e.g. ecoregions, regions) to reduce fire risk or severity results in more carbon emissions than fire, and creates a long-term carbon deficit that undermines climate goals."

### **5. Avoid or minimize post-fire harvesting and allow natural regeneration to occur.**

Natural regeneration is more likely to support re-establishment of local biodiversity, whereas, "post-fire logging worsens conditions...and impedes the rate of recovery", which can lead to, "a significant loss of ecosystem services."

## The Need for Transformative Change

Even at the level of staid global governance organizations, the need for transformative change in response to the climate and nature emergency is being recognized. Ana Maria Hernandez Salgar, Chair of IPBES, states:

“Transformative change in all parts of society and our economy is needed to stabilize our climate, stop biodiversity loss and chart a path to the sustainable future we want. This will also require us to address both crises together, in complementary ways.”

Scientists such as Dr. Suzanne Simard, through painstaking research spanning the past few decades, have started to reveal an understanding of forests and nature that Indigenous Peoples have had for millennia, one that recognizes the living beingness of nature, the complexity, connectedness, and self-organizing intelligence of forests and other elements of nature. This new-old understanding points the way forward to a paradigm-shifting relationship with forests and nature that could help bring about the transformative change that the Chair of IPBES and others see as essential to achieving a livable planet. This new-old perspective is based on reciprocity, respect and gratitude rather than on objectification of nature and viewing forests and other elements of nature as resources to be extracted for the sole benefit of humans.

*“The cohesion of biodiversity in a forest, the musicians in an orchestra, the members of a family growing through conversation and feedback, through memories and learning from the past, even if chaotic and unpredictable, leveraging scarce resources to thrive. Through this cohesion, our systems develop into something whole and resilient. They are complex. Self-organizing. They have the hallmarks of intelligence. Recognizing that forest ecosystems, like societies, have these elements for intelligence helps us leave behind old notions that they are inert, simple, linear, and predictable. Notions that have helped fuel the justification for rapid exploitation that has risked the future existence of creatures in the forest systems.*

*I come from a family of loggers, and I am not unmindful that we need trees for our livelihoods. But my salmon trip showed that with taking something comes the obligation to give back. Of late I’ve become increasingly enchanted by the story told by Subiyay, who talks of the trees as people. Not only with a sort of intelligence - akin to us humans - or even a spiritual quality perhaps not unlike ours. Not merely equivalent to people, with the same bearings.*

*They are people. The Tree People.*

*I believe this kind of transformative thinking is what will save us. It is a philosophy of treating the world’s creatures, its gifts, as of equal importance to us. This begins by recognizing that trees and plants have agency. They perceive, relate, and communicate: they exercise various behaviors. They cooperate, make decisions, learn, and remember - qualities that we normally ascribe to sentience, wisdom, intelligence... Making this transformation requires that humans reconnect with nature - the forests, the prairie, the oceans - instead of treating everything and everyone as objects for exploitation. It means expanding our modern ways, our epistemology and scientific methodologies, so that they complement, build on, and align with Aboriginal roots.”*

- Dr. Suzanne Simard

With great challenge, comes great opportunity. We are faced with the existential challenge of the climate and nature emergencies. By transforming our personal and societal relationship with forests and nature towards one of reciprocity, respect and gratitude and the recognition of the living beingness of nature, we can find the path to a sustainable future that achieves a livable climate and healthy web of life for generations to come. We would like to thank Massachusetts Native Americans and Indigenous Peoples from around the world for reminding us of these truths.

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## APPENDIX A

### INDIGENOUS STEWARDSHIP RESOURCES

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#### Materials in this appendix:

- **Dennis/Native Land Conservancy Cultural Respect Agreement**
- **Mount Grace/Nipmuc Cultural Respect Agreement**
- **Links and book suggestions for more information**

This section includes tools and resources for learning about, engaging with, and granting land access to Indigenous peoples. Included are two local examples of legal arrangements which can be used to formalize and codify Indigenous property access for a variety of reasons including cultural use, harvesting of food or materials, or ceremony. The first document, a cultural respect agreement between the Dennis Conservation Trust and the Native Land Conservancy, lays out a common purpose of such documents in the following language:

*"It is the purpose of this agreement to protect the native marine and terrestrial resources located on the property, to honor them and protect them, and to assure that the property will be retained in its natural state and for its cultural conservation values, and to prevent any use of the property that would significantly impair or interfere with the cultural conservation values of the property."*

These tools are provided as a jumping off point for property owners and managers to begin considering how to develop an understanding of Indigenous perspectives, and then to engage, develop relationships, and potentially enter into legal arrangements granting property access or ownership.

These resources are by no means extensive, and while an intellectual understanding is helpful, the reader is encouraged to identify tribal organizations in your area and attend the *publically held events* that are hosted by various tribal representatives or groups.

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

**EXAMPLE CULTURAL RESPECT AGREEMENT:  
NATIVE LAND CONSERVANCY & DENNIS CONSERVATION TRUST**

Bk 30177 Pg 217 #66538  
12-20-2016 @ 09:15a

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)  
Dennis MA*

**CULTURAL RESPECT AGREEMENT**

THIS CULTURAL RESPECT AGREEMENT (“Agreement”) is made this 19<sup>th</sup> day of December 2016 by **DENNIS CONSERVATION TRUST**, established under Agreement and Declaration of Trust dated February 27, 1988, and recorded with the Barnstable County Registry of Deeds in Book 6212 Page 96, as amended, (Fed EID # 22-2898846) with a mailing address at P.O. Box 67, E. Dennis 02641, (“Owner”) in favor of the **NATIVE LAND CONSERVANCY, INC.**, a Massachusetts charitable corporation (Fed EID # 46-3944868) with a mailing address of P.O. Box 974, Mashpee MA 02649, (“NLC”), for an initial duration of five (5) years from the date noted above.

**WITNESSETH:**

WHEREAS, Owner is the owner of certain real properties, collectively known as the “Clark et al” tracts located in Dennis Village, Town of Dennis, County of Barnstable, Commonwealth of Massachusetts, and more particularly described in Exhibit A, a sketch attached hereto in Exhibit B and incorporated by this reference (collectively, “the Property”); and

WHEREAS, the Property possesses significant cultural, historic and natural values (collectively “cultural conservation values”) of great importance to Owner and NLC; and

WHEREAS, the specific cultural and natural conservation values of the Property are further documented in an inventory of relevant features of the Property, (“Baseline Documentation”) which are not recorded with this instrument, but shall remain in the files at the offices of both the Owner and NLC, including reports, maps photographs, declarations and other documentation which generally describes the property at the time of the grant the Agreement, and

WHEREAS, in particular, the property has values as an extensive barrier beach, salt marsh and coastal woodland ecosystem of native plants, birds, wildlife, and other ecological and geological features, and, moreover, the property has important cultural significance as a traditional place of gathering, ritual, ceremonial and foraging significance for at least ten thousand years of continuous use by the indigenous people of Cape Cod, notably sachemships of the Wampanoag Tribe, such as those at NobsCUSset and Mattacheese, and the combination of these natural and cultural values are referred to here as “cultural conservation values”; and

WHEREAS, the NLC wishes to honor the continuous association of native peoples with the Property by engaging in cultural practices, defined, for the purposes of this Agreement, as including traditional spiritual ceremonies, seasonal celebrations, offerings, and cultural

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
Dennis MA

education/interpretation, but specifically do not include hunting, trapping, camping, fires, and cutting of trees or other vegetation without Owner's express written consent; and,

WHEREAS, Owner holds the Property subject to a charitable trust provision that requires that the Property be held in an open and natural condition exclusively for conservation purposes forever, (2) wildlife habitat protection and enhancement on such premises specifically shall be promoted, and (3) hunting, the discharge of firearms and trapping on such premises shall be and are prohibited...walking trails may be created, maintained and used and the [owner] is not obligated to post the property in conjunction with limitation (3) above (see Deed of Record in Book 21173 Page 230); and,

WHEREAS, Owner intends, as owners of the Property, to provide to NLC the right to have access to the property for cultural and ceremonial uses that are consistent with said charitable trust deed and to help to preserve and protect the cultural conservation values of the Property; and

WHEREAS, NLC is publicly supported, tax-exempt nonprofit organization, qualified under Section 501(c)(3) of the Internal Revenue Code, whose primary purposes are natural and cultural historic preservation and educational; and NLC agrees by accepting this grant to honor the intentions of Owner stated herein and to preserve and protect the cultural conservation values of the Property.

**NOW, THEREFORE**, in consideration of the above and the mutual covenants, terms, conditions, and restrictions contained herein, and pursuant to the laws of the Commonwealth of Massachusetts, Owner hereby voluntarily grants and conveys to NLC a cultural respect access agreement over the Property of the nature and character to the extent hereinafter set forth ("Agreement") and NLC accepts the Agreement and agrees to honor the intentions of the Owner to preserve and protect the Property.

1. Purpose. It is the purpose of this Agreement to protect the native marine and terrestrial resources located on the Property, to honor them and protect them, and to assure that the Property will be retained in its natural state and for its cultural conservation values, and to prevent any use of the Property that would significantly impair or interfere with the cultural conservation values of the Property. Owner intends that this Agreement will confine the use of the Property to activities to those that are consistent with the purpose of this Agreement and the Deed of Record.

2. Right of NLC. To accomplish the purpose of this Agreement the following rights are conveyed to NLC by this Agreement:

(a) To identify, document, preserve and protect the cultural conservation values of the Property; and

(b) To enter upon the Property during daylight hours and in groups not to exceed twenty (20) persons at any one time, and as supervised by the NLC's Board of Directors, staff or authorized agent; such access may be provided without notice to the Owner, but must conform

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
*Dennis MA*

with cultural practices consistent with the purpose of the Agreement and the Deed of Record; parking for said supervised groups must only occur in designated areas as mutually determined by Owner and NLC; and,

- (c) To erect plaques, signs and other interpretive displays for public education of the natural and cultural significance of the Premises, with the consent of Owner.

3. Prohibited Uses. Any activity on or use of the Property by NLC that is inconsistent with the purpose of this Agreement and Deed of Record is prohibited. Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited:

- (a) Any and all logging, mining, commercial use, development or resource extraction, road building or surface disturbance of the Property;
- (b) Any and all hunting, trapping, or camping; recreational use of the Property that is inconsistent with the intent of this Agreement, including the use of fire without the mutual consent of the parties. Occasional ceremonial use of the site is a use that is deemed consistent with the intent of the Agreement.
- (c) Owner and NLC shall cooperatively enforce prohibited uses of the Property by other parties or the general public;
- (d) The rights granted to NLC by this Agreement are limited to the Native Land Conservancy, Inc., its then-current board of directors and its invited native and non-native guests, and not to any other persons, native or non-native, nor to the general public.

4. Reserved Rights. Owner reserves to itself and to its representatives, successors, and assigns, all rights from their ownership of the Property, including the right to engage in or permit or invite others to engage in all uses of the Property that are not expressly prohibited herein and are not inconsistent with the purpose of this Agreement.

Without limiting the generality of the foregoing, the following rights are expressly reserved:

- (a) Owner has the right to practice prudent and generally accepted conservation land management activities on the Property consistent with the Deed of Record;
- (b) Owner has the right, acknowledged by NLC, to cooperate with local government in any re-design of the layout and reconstruction of Chapin Beach Road through the Property; and,
- (b) Owner is under no obligation to extend the Agreement period beyond its initial five (5) year duration, and may decline to extend or renew the Agreement at its sole discretion.

#### 4.1 Limitations on Owner's Responsibilities.

- (a) Owner shall not be responsible for any unlawful actions of the NLC's representatives.
- (b) Owner assumes no actual or implied responsibility to insure that road conditions allow vehicular access to the Property. NLC acknowledges that there is limited vehicular access to and within the Property currently, that there is no need to improve said access, and that most cultural practices can occur using on-foot access except for those with disabilities who may need temporary accommodation.

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
*Dennis MA*

5. NLC's Remedies. If Owner determines that NLC is in violation of the terms of this Agreement, Owner shall give written notice of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the Property resulting from any use or activity inconsistent with the purpose of this Agreement or Deed of Record, to restore the portion of the Property so injured.

If NLC fails to cure the violation within 30 (thirty) days after receipt of notice, or under circumstances where the violation cannot reasonably be cured within the 30 day period, NLC fails to begin curing the violation within the 30 day period, or fails to continue diligently to cure such a violation until finally cured, Owner may bring an action at law or in equity of competent jurisdiction to enforce the terms of this Agreement, including the potential recovery of damages for loss of natural, cultural, scenic, or environmental values. Without limiting NLC's liability therefor, Owner, in its sole discretion may apply any damages recovered to the cost of undertaking any corrective action on the Property.

If Owner, in its sole discretion, determines that circumstances require immediate action to prevent significant damage to the Property, Owner may terminate this agreement and in addition pursue its remedies under this paragraph without prior notice to NLC or without waiting for the period provided for cure to expire.

6.1 Cost of Enforcement. Any costs incurred by Owner in ensuring compliance with this Agreement and Deed of Record against NLC, including without limitation, costs of suit and attorney's fees and any costs of restoration necessitated by NLC's violation of the terms of this Agreement shall be decided by Owner's remedies at law and shall be paid by NLC.

6.2 Owner's Discretion. Enforcement of the terms of this Agreement shall be at the discretion of Owner, and any forbearance by Owner to exercise its rights under this Agreement shall not be deemed or construed to be waiver by Owner of such term or of any subsequent breach of the same or any other term of this Agreement or of any of Owner's rights under this Agreement. No delay or omission by Owner in the exercise of any right or remedy upon any breach by Owner shall impair such right or remedy, or be construed as a waiver.

7. Public Access. No right of access by the general public to any portion of the Property is conveyed by this Agreement. Owner may allow public access for passive recreation at its discretion.

8. Costs and Liabilities. NLC agrees to exonerate, protect, defend, indemnify and hold Owner, its officers, trustees, agents and employees harmless from and against any and all losses, damages, penalties, fines, claims, suits or actions, judgments and costs (including reasonable attorneys' fees) arising out of any injury to or death of persons or damage to property on or about the Property in connection with any the exercise of the rights of NLC set forth herein, except to the extent caused by the intentional or negligent acts or omissions of Owner its employees, agents or contractors.

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
*Dennis MA*

9. Extinguishment. If circumstances arise in the future such as render the purpose of this Agreement impossible to accomplish, this Agreement can only be terminated or extinguished, whether in whole or part, by judicial proceedings in a court of competent jurisdiction. The Owner shall be entitled to all proceeds from any sale, exchange or involuntary conversion of all or any portion of the Property subsequent to such termination or extinguishment.

10. Amendment. If circumstances arise under which an amendment to or modification of this Agreement would be appropriate, Owner and NLC are free to jointly amend this Agreement; this Agreement cannot be amended without written approval by both the Owner and the NLC provided that no amendments shall be allowed that will affect the qualification of this Agreement or Deed of Record, and any amendments shall be consistent with the purpose of this Agreement, shall include reference to the significant cultural conservation values and be consistent with protecting those values. Any such amendment shall be recorded in the Barnstable County Registry of Deeds.

11. Assignment. This Agreement is non-transferable and does not extend to successors or assigns of the NLC. In the event that the NLC ceases to exist, its successors or assigns must seek to re-negotiate this Agreement, which may be granted at the sole discretion of the Owner.

12. Extension. It is intended that this Agreement be extended or be converted into a perpetual easement by mutual agreement, after the initial five (5) year Agreement period, based on good faith analysis by the parties as to its effectiveness and lack of unintended consequences. Neither Owner nor NLC will be held at fault if there is no extension of the agreement after the five (5) year period.

13. Notices. Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage prepaid, addressed as follows:

To Owner: Dennis Conservation Trust, P.O. Box 67, E. Dennis MA 02641

To NLC: Native Land Conservancy, Inc., P.O. Box 974, Mashpee MA 02649,

or to such other address as either party from time to time shall designate by written notice to the other.

14. Recordation. NLC shall record this Agreement in timely fashion in the official records of Barnstable County at its expense and provide a copy as recorded to the Owner.

15. General Provisions.

a) Controlling Law. The interpretation and performance of this Agreement shall be governed by laws of the Commonwealth of Massachusetts.

b) Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Agreement shall be liberally construed in favor of the grant to effect the purpose of this Agreement. If any provisions in this instrument are found to be ambiguous, and interpretation

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
*Dennis MA*

consistent with the purpose of this Agreement that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Severability. If any provision of this Agreement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Agreement, or the application of such provisions to persons or circumstances other than those as to which is found to be invalid, as the case may be, shall not be affected thereby.

d) Entire Agreement. This instrument sets forth the entire agreement of the parties and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Agreement, all of which are merged herein. No alteration or variation of this document shall be valid or binding unless contained in an amendment that complies with paragraph 10.

e) Termination of Rights and Obligations. A party's rights and obligations under this Agreement terminate upon transfer of the party's interest in the Agreement or Property, except that liability for acts or omissions occurring prior to the transfer shall survive transfer.

g) Captions. The captions in this instrument have been inserted solely for convenience of reference and are not part a part of this instrument and shall have no effect upon construction or interpretation.



APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

Clark et al Properties - Cultural Respect Agreement (DCT to NLC)  
Dennis MA

In witness hereof, on this 19<sup>th</sup> day of December, 2016, both parties are in agreement.

**Owner: Dennis Conservation Trust:**



Carole W. Bell, Vice-President/Trustee

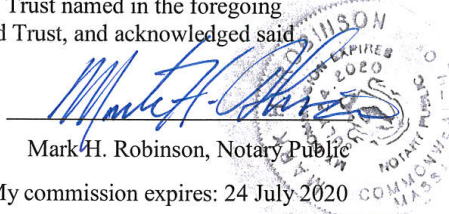


Frank Dahlstrom, Treasurer/Trustee

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss.

On this 19<sup>th</sup> day of December 2016, before me personally appeared the above-named Carole W. Bell, to me personally known, who being by me duly sworn did say that she is the Vice-President/Trustee of the Dennis Conservation Trust named in the foregoing instrument; that she is duly authorized to act on behalf of said Trust, and acknowledged said instrument to be the free act and deed of said Trust.



Mark H. Robinson, Notary Public  
My commission expires: 24 July 2020

**NLC: Native Land Conservancy, Inc.**

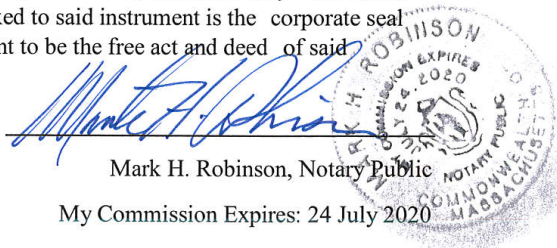


Ramona Peters, President/Treasurer

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss.

On this 19<sup>th</sup> day of December 2016, before me personally appeared the above-named Ramona Peters, to me personally known, who being by me duly sworn did say that she is the President and Treasurer of the corporation named in the foregoing instrument; that she is duly authorized to act on behalf of said corporation; that the seal affixed to said instrument is the corporate seal of said corporation; and acknowledged said instrument to be the free act and deed of said corporation.



Mark H. Robinson, Notary Public  
My Commission Expires: 24 July 2020

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

*Clark et al Properties - Cultural Respect Agreement (DCT to NLC)*  
*Dennis MA*

Exhibits

- A- Description
- B – Locus Sketch
- C – Traditional Sachemships Locus Map

**EXHIBIT A****Description of the Property**

The Property that is subject to the terms and provisions of this Cultural Respect Agreement is located in the Village of Dennis, Town of Dennis, County of Barnstable, Commonwealth of Massachusetts, and consists of various adjoining parcels (collectively, “the Property”), more particularly described as follows:

All of land and waters owned by the Dennis Conservation Trust, as its interests may appear, adjoining Black Flats Road, so-called, and Chase Garden Creek and its marshes, as shown on Town of Dennis Assessing Sheets #297, 321, 322 and 323.

Containing 250 acres, upland and wetland, more or less.

For title, see Deed of Record in Book 21173 Page 230 in the Barnstable County Registry of Deeds.

See also the following deeds for specific descriptions of the parcels comprising the Property:

Deeds Book 6594 Page 152  
 Deeds Book 6606 Page 244  
 Deeds Book 7053 Page 348  
 Deeds Book 9005 Page 120, Plan Book 497/39, Lot 4  
 Deeds Book 12434 Page 159  
 Deeds Book 12926 Page 57  
 Deeds Book 13098 Page 183  
 Deeds Book 18802 Page 117

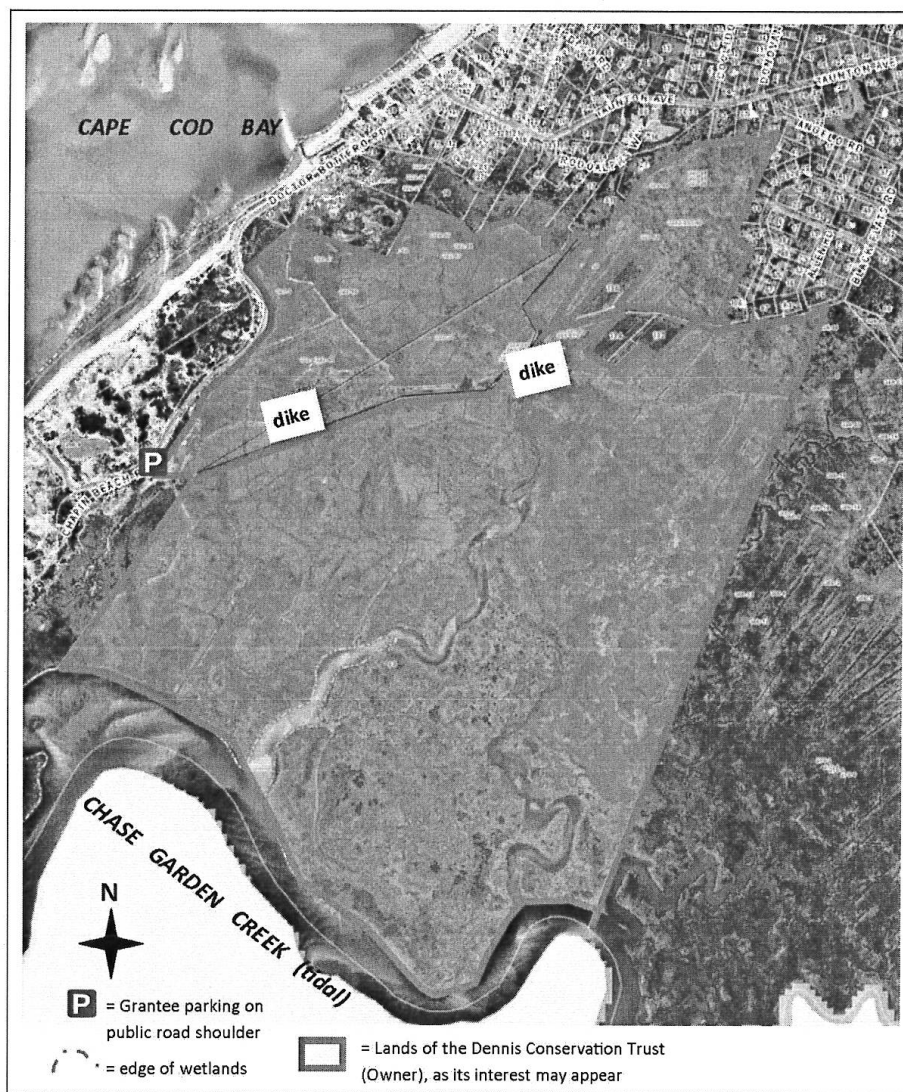
See Exhibit B for locus sketch of the Property.

Street Address: off Chapin Beach Road and off Black Flats Road, Dennis MA.

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

Clark et al Properties - Cultural Respect Agreement (DCT to NLC)  
Dennis MA

**EXHIBIT B  
Locus Sketch of the Property**

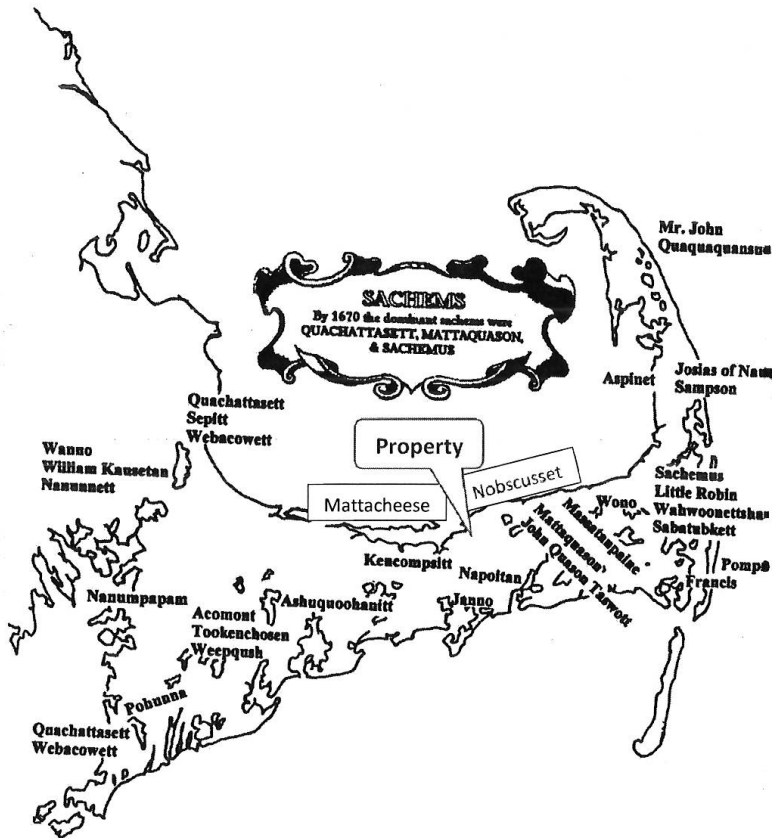


APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

Clark et al Properties - Cultural Respect Access Agreement (DCT to NLC)  
Dennis MA

EXHIBIT C  
Wampanoag Sachems of 1670

The Property is situated in the vicinity of the  
Mattacheese and NobsCUSset sachemships



**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

Bk 34735 Pg140 #80184

NOT EXHIBIT B NOT  
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**CULTURAL RESPECT EASEMENT**

We walk together.

The Trustees of the Dennis Conservation Land Trust (DCLT) recognize that the land in our town holds significant cultural, historic, and natural value to the Indigenous people of Cape Cod.

The Trustees wish to formally grant to the Members of the Native Land Conservancy (NLC) access in perpetuity to those lands owned by the DCLT, with every hope the Members of the Native Land Conservancy will re-connect with these lands, lands that provided sustenance to them for thousands of years.

The Trust further supports the NLC Members' rights to conduct ceremonies and renew their oral traditions on this land.

Through the attached Cultural Respect Easement, we wish to create an open and sharing relationship with the NLC, one in which we support one another, underscoring our mission to create and care for open space, as well as learning, together, how to create an environment of respect. Respect for one another. Respect for the land. Respect for every living thing, plant or animal, that shares this land with us.

For several hundred years we have walked different paths. It is our intent, through this agreement, that we walk together to renew the spirit of the land.

APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

Bk 34735 Pg141 #80184



**EXHIBIT C**

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CULTURAL RESPECT EASEMENT

Dec. 2021

This Cultural Respect Easement is a testament to the friendship cultivated between the Native Land Conservancy and Dennis Conservation Land Trust. Our friendship embraces cultural respect in both spirit and practice.

A Cultural Respect Easement is the closest expression of land repatriation to indigenous people achieved without an actual transfer of deed. It offers assurance for us to safely access areas of our ancestral homelands to exercise cultural practices. Respect for our culture includes respect for our relationship with the earth, especially in areas where our ancestors prayed, danced, toiled, lived, and were buried.

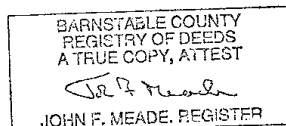
Landowners adopting such an easement allow us to embrace and exercise our cultural heritage on lands that have significance and relevant locale. The easement empowers our allies to use their privilege to protect the sanctity of ceremony while indigenous people assemble.

It is historically meaningful that people benefiting from the actions perpetrated by colonists welcome and protect the ceremonial presence of the original people of this continent. Our safety, even on public lands, has not been something we could count on for over three hundred years. For a number of ill thought reasons indigenous people in the United States were prohibited by law to gather for traditional ceremony up until 1978. Through an act of Congress, we became free to exercise our spiritual practices again. During the past 40+ years we have sought to return to the areas where sacred sites exist to resume our ceremonies. The cultural respect easement is one way to perpetuate access.

We require respect for our culture, which also includes our history. We have certain sensitivities connected to the painful loss of our ability to protect ourselves and the earth. Both parties of this Cultural Respect Easement have gone beyond our polarized cultural histories and centered on our mutual love for the land.

The Native Land Conservancy deeply honors, appreciates, and respects all persons and organizations that protect the earth with care. It is very meaningful to have more land space for tribal communities to exercise our cultural heritage in a much larger expanse. The Dennis Conservation Land Trust has extended this cultural respect easement to include all land within their present holdings in perpetuity. This level of initiative is an extraordinary example of authentic fellowship that will ripple through generations to come.

BARNSTABLE REGISTRY OF DEEDS  
John F. Meade, Register



**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES****EXAMPLE CULTURAL AGREEMENT:  
MOUNT GRACE- NIPMUC CULTURAL PRESERVATION INC.****Bk: 67940 Pg:  
247**

# Worcester South District Registry of Deeds Electronically Recorded Document

This is the first page of the document - Do not remove

## Recording Information

Document Number	
Document Type	
Recorded Date	
Recorded Time	
	: 79613
	: AGR
	: July 21, 2022
	: 10:45:24 AM
Recorded Book and Page	
Number of Pages(including cover sheet)	
Receipt Number	
Recording Fee	
	: 67940 / 247
	: 12
	: 1458711
	: \$105.00

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

Worcester South District Registry of Deeds  
Kathryn A. Toomey, Register  
90 Front St  
Worcester, MA 01608  
(508) 798-7717

Affected  
Premises s

3 Narrow Lane  
Petersham,  
MA

Bk: 67940 Pg: 248

**Cultural Respect and Use Agreement For 3 Narrow Lane, Petersham  
Mount Grace Land Conservation Trust**

16th

**THIS CULTURAL RESPECT AND USE AGREEMENT ("Agreement") is  
made this**

**day of**

**\_ March \_ 2022 ("effective date") between The Nipmuck Cultural  
Preservation, Inc., having a mailing address of 197 Scott Rd, Oakham, MA 01068  
("Tribe") and the Mount Grace Land Conservation Trust, Inc., a Massachusetts non-profit, having a  
mailing address of 1461 Old Keene Rd, Athol, MA 01331 ("Land Holder").**



## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

### BACKGROUND:

**The Tribe, known as the "fresh water people," have lived in the Mount Grace Land Conservation Trust Region in Massachusetts for thousands of years, in harmony with the area's spiritual and natural features. The Nipmuc/k tribe are a state acknowledged tribe. The Tribe's present-day boundaries of their original homelands include all of central Massachusetts from the New Hampshire/Vermont borders, south of the Merrimac Valley, southerly to include Tolland and Windham counties in Connecticut, the northwest portion of Rhode Island, to the east included the Natick/Sudbury, and to the west including the Connecticut River Valley.**

**The Land Holder is the owner of certain real property that was originally used by the ancestors of the Tribe members.**

**The real property is located at 3 Narrow Lane, in what is now known as the Town of Petersham, Worcester County, State of Massachusetts, as more particularly described in the deed to the Land Holder recorded on December 28, 2011 in the Worcester County Deeds at Book 48332, Page 347, incorporated herein by this reference (the "Property"), and as shown as Parcel A in a plan of land recorded in the Worcester Country Registry of Deeds in Plan Book 766, Plan 76 and attached as Exhibit**

A.

**The Property is protected by a Conservation Restriction ("CR"), held by East Quabbin Land Trust, having a mailing address of P.O. Box 5, Hardwick, Massachusetts, 01037 (the "Conservation Restriction Holder") and recorded on December 28, 2011 in the Worcester County Registry of Deeds as Book 48332, Page 351. A copy of the CR has been provided to the Tribe.**

Bk: 67940 Pg: 249

**The Property, in the area named Nichewaug by the Tribe, includes and contains significant cultural values (collectively "Cultural Values") of significant and longtime importance to the Tribe and acknowledged by the Land Holder, including the following:**

**Source of traditional medicine and food ways**

**Providing spiritual connection to the Land**

**Holding spiritual ceremonies**

**Connecting with ancestral artifacts**

**Place to conduct cultural teaching and interact with community**

**Provide a space for Tribal members to heal**

**The property also contains the conservation values ("Conservation Values") protected**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

by the CR and respected by the Land Holder and Tribe, including the following:

**Prime forest land soils, in which the CR will allow for and ensure that the land remains suitable for sustainable and sound management of the forest resources and encourages long-term professional stewardship of these resources in a manner consistent with best management practices.**

Diversity **of habitat forests, wetlands, streams, and access** to what is now called Lorinda Pond. A substantial portion of the premises **has been identified as Critical Natural Landscape on the Biomap2 published by the Natural Heritage and Endangered Species Program of the Massachusetts Department of Fish and Game. Permanent protection of the Property in a natural condition is beneficial to the plant and animal communities inhabiting the Property and contributes significantly to the protection of native biodiversity of the Commonwealth of Massachusetts.**

**Lorinda Pond, Lorinda Brook, and associated wetlands are tributaries (via Moccasin Brook and the East Branch of the Swift River) to the Quabbin Reservoir, which provides drinking water to metropolitan Boston and other cities and towns in eastern Massachusetts. Protection of the property from development thus helps to protect the quality of this important public water supply.**

**Retention of the property in its natural, scenic, and open condition provides a buffer area and helps protect the integrity of adjoining conservation lands to the east, owned by the Massachusetts Department of Fish and Game, and to the west, subject to conservation restrictions acquired by the Massachusetts Department of Conservation and Recreation under the federal Forest Legacy Program.**

**The Conservation Values of the Property are documented in the Baseline Documentation Report, which is not part of this Agreement, but which has been shared with the Tribe by the Land Holder.**

**The Land Holder manages the Property for conservation purposes consistent with its mission, the Cultural Values, and the Conservation Values.**

The Tribe wishes to **honor the Cultural Values of the Property by engaging in certain cultural practices as further set forth in this Agreement**, including sustainable harvesting activities, **traditional spiritual ceremonies, seasonal celebrations, offerings, and cultural education (the “Cultural Uses”).**

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In consideration of the above and the mutual terms and conditions contained herein, the Tribe and the Land Holder hereby **agree** to the **following** specific terms of **this Agreement**.

### 1. Purpose

**The Parties enter into this agreement based on their shared respect and care of the Property and for its land, water, plants, and wildlife that live in and on them and based on respect for the history and historic uses of this land and its resources. It is the purpose of**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

**this Agreement to recognize this history, and honor and facilitate the Tribe's access to the Property for Cultural Uses that are consistent with the perpetual protection of the Cultural Values and Conservation Values of the Property.**

### 2. Term

**This agreement shall remain in effect for 5 years from the Effective Date, unless terminated earlier in accordance with the process listed in Section 7. This Agreement may be renewed or extended upon the mutual written consent of the Tribe and Land Holder.**

### 3. Cultural Uses by the Tribe

**The Tribe is hereby granted a license to engage in the following Cultural Uses on the Property, subject to the conditions and limitations set forth in the CR and this Agreement:**

- A) Sustainable harvesting or extraction of food or medicine. Larger scale harvesting or extraction requires pre-approval, which the Land Holder must request of the Conservation Restriction Holder.**
- B) Ceremonial Activities. The Tribe shall be permitted to engage in spiritual and ceremonial activities such as, but not limited to, dances, music playing, temporary shelter setting and overnight use, memorials, celebrations that do not materially alter the landscape and do not degrade environmental quality. Ceremonial fire is permitted, with the caveat that it will not be used at certain times deemed unsafe by the local fire authorities (Petersham Fire Department) and must be completely extinguished upon completion of ceremony.**
- C) Signs. A reasonable number of signs, or boundary markers, no larger than 4 square feet indicating the status of the land as a cultural site and conservation area, restrictions on use of area, cultural and conservation values, or other important information may be used.**

**Questions the Tribe may have about whether an alternative activity is allowed under the CR shall be directed to the Land Holder for clarification. The Parties recognize that the Tribe's use of the Property may, in some instances, require permits or approvals from the CR holder or others. The Tribe agrees to obtain permits and approvals when necessary and to comply with the conditions of any permits or approvals. Notwithstanding the foregoing, the Land Holder will be exclusively responsible for seeking any required approvals from the Conservation Restriction Holder.**

### 4. Access

**The license granted to the Tribe by this Agreement gives it the following right to access the Property:**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

A) Pedestrian **access only**. The Tribe shall have **the** right to access **the** Property only on **foot**.

**Should** the Tribe wish to **make** trails for easier access **to areas of the** property, the Tribe shall **communicate, in writing, with** the Land **Holder the** proposed location of the **trails**. The **trails must be unpaved and** cannot have a **travel surface** that exceeds five **(5) feet in width**. **B)**

Vehicle parking is available alongside the **Narrow Lane Road**. **If additional** parking is **needed,**

**the Tribe shall** communicate **with** the Land **Holder and accommodations can be made** for a parking area **adjacent to** **Narrow Lane** that does not exceed 500 square feet **(per the CR)**. **If the** Tribe needs **to use a motorized** vehicles to portage **any ceremonial equipment,** special arrangements **will need to** be made in advance between **the Land Holder and the**

**Conservation Restriction** Holder, and **it is not guaranteed that the Conservation** Restriction Holder **would** approve such **use**.

The Tribe **acknowledges** that its license to **access** the property is **not exclusive** and **may be shared with employees or agents of** the Land **Holder**. **If temporary** exclusive use is sought by the Tribe, **application for a period** of exclusive use **by** the Tribe **may** be made in writing **to the Land Holder** for a specific time-limited events/ceremonies **that the Tribe would like to be private**. The Land **Holder will** make a good **faith effort** to accommodate requests **and will** respect the privacy **of the Tribe in its** use **of the land during** these requested time periods **subject to this** Agreement and the CR.

### 5. Prohibited Uses

**This property has a Conservation Restriction (CR), held by the East Quabbin Land Trust, that has been provided to** the Tribe in a **separate** document. Any use of the premises **or activity which materially impairs the purposes of the CR** or other significant conservation interests is **prohibited unless necessary** in an emergency for the protection **of the conservation interests that are subject of the CR**. **There are "Reserved Rights and Exemptions"** described in the Conservation Restriction. **Should the Tribe wish to request an exemption,** the Tribe should **contact** the Land **Holder**. The Land **Holder will** communicate with the Conservation Restriction Holder, but **it is not guaranteed that the exemption request will be approved by the** Conservation Restriction Holder.

### 6. Communication

A. **Contact Persons:** Each party shall designate a **Contact** Person to serve as a **point of**

**communication for the other party**. The **current** email **address** and phone **number of the Contact Person shall be kept on file by both parties**. The **initial Contact Person shall** be as follows:

**Tribe: Fred Freeman, 197 Scott Rd, Oakham, MA 01068**

**Land Holder: Jennifer Albertine, 1461 Old Keene Rd, Athol, MA 01331**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

Either party may from time to time designate a replacement Contact Person by written notice to the other party.

**B. Annual Meeting:** Absent to an agreement to the contrary, the respective Contact

Persons for the Land Holder and the Tribe, or their designees, shall meet annually at a date, location, and time convenient for the parties to review and discuss any questions

Bk: 67940 Pg: 252

or concerns regarding the activities conducted pursuant to this Agreement. The annual meeting may take place by videoconference at the request of either party.

C. Notices: Any notice, demand, request, consent, or communications that either party desires or is required to give to the other shall be in writing, unless expressly permitted in another section of this Agreement to be oral, and sent by personal delivery, first class mail, or electronic mail to each party's respective Contact Person.

### 7. Dispute Resolution

**A. Informal Dialogue.** The Tribe and the Land Holder desire that issues arising from

time to time concerning the interpretation of this Agreement, or any use or activity on the Property, will first be addressed through candid and open communication between the parties rather than unnecessarily formal or adversarial action. Therefore, if either party becomes concerned about whether any proposed or actual use, activity, or failure to take action (which together for the purpose of the Section 7 shall be referred to as the "Activity") complies with this Agreement, wherever reasonably possible the concerned party shall notify the other party of the perceived or potential problem, and the parties shall explore the possibility of reaching an agreeable resolution by informal dialogue.

**B. Mediation.** If informal dialogue does not resolve a disagreement regarding the

Activity, and if the Tribe agrees not to proceed or continue with the Activity pending resolution of the disagreement concerning the Activity, either party may refer the disagreement to mediation by written notice to the other. Within thirty (30) days of the delivery of such notice, the parties shall agree on a single impartial mediator. Each party shall pay its own legal fees and other associated costs, and the costs of the mediation shall be split equally between the parties. Mediation shall be conducted in accordance with the rules selected by the mediator or otherwise mutually agreed upon by the parties.

**C. Termination of Legal Action.** In the event that mediation pursuant to Section 7B

does not resolve the dispute or, notwithstanding Section 7B, if the Land Holder, in its discretion,

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

**believes that an Activity by the Tribe has caused, is causing, or may cause substantial harm or damage to the Conservation Values of the Property or violates the Conservation Restriction, the Land Holder may unilaterally prohibit the Activity. If the Activity does not cease, the Land Holder may do any or all of the following: (i) terminate this Agreement upon notice to the Tribe, (ii) require the Tribe restore the Property to its prior condition; and/or (iii) file suit for a temporary restraining order, preliminary injunctions or other form of equitable relief from any court of competent jurisdiction to cause the cessation of the Activity.**

**D. Cost of Enforcement. Any costs incurred by the Land Holder in ensuring compliance**

**with this Agreement against the Tribe, including without limitation, costs of suit and attorney's fees and any costs of restoration necessitated by the Tribe's violation of the terms of this Agreement shall be paid by the Tribe.**

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### 8. Liability

**A. The Land Holder shall not be responsible for any unlawful or unauthorized actions of the Tribe or its agents, members, or invitees. The Tribe shall assume all risks engaging in any activities on the Property. The Tribe and any other individuals engaging in Cultural Uses permitted under this Agreement shall be responsible for ensuring that all such Cultural Uses take place only in this Property and not on any adjacent property, except with the prior written permission of the owners of such adjacent property.**

**B. The Tribe agrees to release, defend, indemnify and hold harmless the Land Holder, its**

**officers, trustees, agents, and employees from and against any and all losses, damages, penalties, fines, claims, suits or actions, judgments and costs (including reasonable attorneys' fees) arising out of any injury to or death of persons or damage to the Property and to personal property on or about the Property or adjacent or nearby real property in connection with any the exercise of the rights of the Tribe set forth in this agreement, except to the extent caused by the intentional or negligent acts or omissions of the Land Holder, its employees, agents or contractors.**

**C. The parties intend that all Cultural Uses shall fall within the scope of the Massachusetts**

**recreational use statute (General Laws Part I Title II Section 17C) which provides**

**immunity for landowners who do not charge a fee for access to their property for recreational and harvesting activities.**

**D. Prior to holding any event attended by individuals who are not members of the Tribe, the Tribe shall have all attendees sign a waiver that includes the language given as Exhibit B.**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

### 9. Amendment

If circumstances arise under which an amendment to the Agreement would be appropriate, the Tribe and the Land Holder are free to jointly amend this Agreement. However, this Agreement cannot be amended without written approval by both the Tribe and the Land Holder.

### 10. General Provisions

**A. Controlling Law.** The interpretation and performance of this Agreement shall be

**governed by laws of the State of Massachusetts.**

**B. Severability.** If any provisions of this Agreement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Agreement, or the application of such provisions to persons or circumstances other than those as to which is found to be invalid, as the case may be, shall not be affected thereby.

**C. Entire Agreement.** This Agreement sets forth the entire agreement of the parties and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Agreement, all of which are merged herein.

**D. No Waiver.** Enforcement of the terms of this Agreement shall be at the discretions of either party, and any forbearance by either party to exercise its rights under this

Bk: 67940 Pg: 254

**Agreement shall not be deemed or construed to be waiver by the other party. No delay or omission by either party in the exercise of any right or remedy upon any breach by the other party shall impair such right or remedy or be construed as a waiver.**

**E. Assignment.** This Agreement is non-transferable and does not extend to successors

**or assigns of the Tribe or the Land Holder.**

Bk: 67940 Pg: 255

In witness hereof, on the dates set forth below, the latter of which should be Effective Date, parties are in agreement with the Cultural Respect and Use Agreement For 3 Narrow Lane, Petersham.

**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES****RELEASE AND WAIVER**

In consideration of being given **permission** to enter onto property owned by Mount Grace Land Conservation Trust, Inc. (the "Premises"), I hereby agree to release and discharge Mount Grace Land Conservation Trust, Inc., a Massachusetts non-profit, having the mailing address of 1461 Old Keene Rd, Athol, MA 01331 on behalf of myself, my children, my parents, my heirs, assigns, personal representatives, my invitees, and estate as follows:

1. I acknowledge that entering onto the Premises entails known and unanticipated risks which could result in physical or emotional injury, paralysis, death, or damage to myself, to property, or to third parties. I understand such risks simply can not be eliminated without jeopardizing the essential qualities of the activity.

**The risks include, among other things: Tripping, slipping, bodily injury, paralysis, and death.**

2. I expressly agree and promise to accept and assume all risks associated with my presence on the Premises. My use of the Premises is entirely voluntary, and I elect to participate knowing and assuming the risks.

3. I expressly agree to assume responsibility for myself when on the Premises and hold the Mount Grace Land Conservation Trust, Inc. harmless from and against any claims arising out of my presence on the Premises.

4. I hereby voluntarily release, forever discharge, and agree to indemnify and hold harmless Mount Grace Land Conservation Trust, Inc. from any and all claims, demands, or causes of action, which are in any way connected with my use or presence on the Premises including any such claims which allege negligent acts or omissions of Mount Grace Land Conservation Trust, Inc. and including any attorney's fees incurred by Mount Grace Land Conservation Trust, Inc. to defend any claim.

5. Should Mount Grace Land Conservation Trust, Inc. or anyone acting on their behalf be required to incur attorney's fees and costs to enforce this Agreement, I agree to indemnify and hold them harmless for all such fees and costs.

6. I certify that I have adequate insurance to cover any injury or damage I may cause or suffer while on the Premises or else I agree to bear the costs of such injury or damage myself. I further certify that I have no medical or physical conditions which could interfere with my safety while on the Premises, or else I am willing to assume — and bear the costs of all risks that may be created, directly or indirectly, by any such condition.

7. In the event that I file a lawsuit against Mount Grace Land Conservation Trust, Inc. on behalf



**APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES**

**of myself or others arising out of my presence on the Premises, I agree to do so solely in the Commonwealth of Massachusetts, and I further agree that the substantive law of Massachusetts that state shall apply in that action without regard to the conflict of law rules in any state.**

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**By signing this document, I acknowledge that if anyone is hurt or property is damaged as a result of my entry onto the Premises, I, my family, my children, or my invitees may be found by a court of law to have waived my right to maintain a lawsuit against Mount Grace Land Conservation Trust, Inc. on the basis of any claim from which I have released them herein.**

**I have had sufficient opportunity to read this entire document. I have read and understand it, and I agree to be bound by its terms.**

**Sign**

**PRINT NAME:**

**Date**

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

### RESOURCES: WEBSITES, BOOKS, & REFERENCES

#### RELATIONSHIP BUILDING

- Hager, Shirley N. and Mawopaiyane. 2021. The Gatherings: Reimagining Indigenous-Settler Relations. Aevo UTP/ University of Toronto Press.
- Joseph, Bob and Joseph, Cynthia F. 2019. Indigenous Relations: Insights, Tips, and Suggestions to Make Reconciliation a Reality. Indigenous Relations Press.
- Menakem, Resmaa. 2017. My Grandmother's Hands: Racialized Trauma and the Pathway to Mending our Hearts and Bodies. Central Recovery Press. (has some history in it as well)
- Jacobs, Margaret D. 2021. After 100 Winters: In Search of Reconciliation on America's Stolen Lands. Princeton University Press. (has some history in it as well)

#### HISTORY: NEW ENGLAND SPECIFIC

- Mandell, Daniel R., 2007. Tribe, Race, History- Native Americans in Southern New England 1780-1880. Johns Hopkins University.
- Connoles, Dennis A. 2001. The Indians of the Nipmuck Country in Southern New England, 1630-1750. McFarland & Company, Inc., Publishers.
- Brooks, Lisa. 2018. Our Beloved Kin – A New History of King Philip's War. Yale University
- O'Brien, Jean M. Dispossession by Degrees – Indian Land and Identity in Natick, Massachusetts, 1650-1790. University of Nebraska

#### TRADITIONAL ECOLOGICAL KNOWLEDGE

- Hernandez, Jessica. 2022. Fresh Banana Leaves: Healing Indigenous Landscapes through Indigenous Science. North Atlantic Books.
- Kimmerer, Robin W. 2013. Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and

the Teaching of Plants. Milkweed Editions.

- Nelson, Melissa K. and Schilling, Dan. 2018. Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability. Cambridge University Press.
- Menzies, Charles R. 2006. Traditional Ecological Knowledge and Natural Resource Management. University of Nebraska.

#### CONSERVATION

- First Light Learning Journey- Excellent model of conservation organizations working with Tribes of the Wabanaki Confederacy in Maine, lots of resources and tools- <https://firstlightlearningjourney.net/>
- Tribal Adaptation Menu Team. 2019. Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu. Great Lakes Indian Fish and Wildlife Commission, Odanah Wisconsin. <https://forestadaptation.org/tribal-climate-adaptation-menu>

*\*\* Caveat: Giving Tobacco to the Nipmuc Tribal partners or other Indigenous Tribal Partners of the Eastern Woodlands would not be appropriate and seen as disrespectful. In exchange for their knowledge, we should compensate them for their time financially. Other gifts, non-ceremonial in origin (like berries for example), are appropriate in addition to the financial compensation.*

#### WEBINARS

- Ohketeau Cultural Center. 2021. The Living Presence of our History Part III: Healing Reparations Through the Land Back Movement: A Conversation on Indigenous Land Tenure and Access. <https://youtu.be/5UVj1rGhKt4> (Local Indigenous Voices speaking about land back)

## APPENDIX A: INDIGENOUS STEWARDSHIP RESOURCES

- Land Trust Alliance. 2021. Making Connections with Indigenous Communities. [https://iweb.lta.org/Purchase/ProductDetail.aspx?Product\\_code=WEB\\_INDIGENOUS](https://iweb.lta.org/Purchase/ProductDetail.aspx?Product_code=WEB_INDIGENOUS)
- Land Trust Alliance. 2022. Strategies to Restore Indigenous Access to Land. [https://iweb.lta.org/Purchase/ProductDetail.aspx?Product\\_code=WEB\\_INDIGACCESS](https://iweb.lta.org/Purchase/ProductDetail.aspx?Product_code=WEB_INDIGACCESS)

### Northeast (not Indigenous led)

- The Upstander Project <https://upstanderproject.org/>
- The Nolumbeka Project <https://nolumbekaproject.org/>

### WEBSITES OF NIPMUC LED (OR CO-LED) ORGANIZATIONS

- The Ohketeau Cultural Center <https://www.ohketeau.org/> Check out their Living Presence of our History Series!
- Nipmuc Indian Development Corporation <http://nippi.org/>
- The Nipmuk Cultural Preservation, Inc. <https://www.facebook.com/nipmukculturalpreservation/>
- Eastern Woodlands Rematriation Collective. <https://www.facebook.com/EWRematriation/>
- Massachusetts Center for Native American Awareness. <https://www.mcnaa.org/>
- Nipmuc Nation <https://www.nipmucnation.org/> -  
\*\*\*Not the traditional tribal government\*\*\*

### OTHER LOCAL TRIBES

- Mashpee Wampanoag Tribe <https://mashpeewampanoagtribe-nsn.gov/>
- Aquinnah Wampanoag Tribe <https://wampanoagtribe-nsn.gov/>
- Herring Pond Wampanoag Tribe <https://www.herringpondtribe.org/>
- Narragansett Tribe <https://narragansettindiannation.org/>

Other groups focused on Indigenous rights in the