



mini  
forests

**CURRICULUM**

**SEPTEMBER 2023**



Network  
of Nature

*The Network of Nature acknowledges that our work reaches across all First Nations territories, Métis Homelands, and Inuit Nunangat. We are grateful for the continued work of many First Nations, Métis, and Inuit peoples who are the original caretakers of the Land and Waters. Through our environmental initiatives, we have a responsibility to respect Indigenous perspectives and elevate Indigenous voices.*

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Cover photo (front) of Toronto Zoo mini forest planting by Madigan Cotterill, 2022 and (back) of Morton Park mini forest planting by Green Venture, 2022. Photos and graphics provided by Dougan & Associates unless otherwise stated.



The goal of this training curriculum is to build an understanding of how to coordinate a Mini Forest project and to support new coordinators through their first Mini Forest event. This document is intended for use by individuals and collectives wanting to organize a mini forest planting event within the urban or suburban landscape in Canada.

*“Trees evolved to grow together in a forest. They intertwine their roots, forming a root matrix that is nearly impossible to uproot. Forest trees with interlocked roots may snap off in big winds, but they typically don’t uproot. Because aesthetics have trumped function for so long, we have planted large, isolated specimen trees ready to blow over nearly everywhere. If we change our goal from creating majestic specimen trees to picturesque groves of trees, the interlocking effect of root matrices will be strongest.”*

*~ Douglas W. Tallamy*



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## Introduction

Thank you for your interest in planting a Mini Forest! The following guidebook will walk you through some of the key features of a Mini Forest, how to design and install a Mini Forest, how to design your project with community engagement in mind, and how to secure financial and professional support for your project.

*“Few of us are in a position to restore the forests... But tens of millions of us have gardens, or access to open spaces such as industrial wastelands, where trees can be planted... and if full advantage can be taken of the potentialities that are available even in heavily built-up areas, new ‘city forests’ can arise.”*

*~ Robert A. de J. Hart*



## Section One: Overview of Mini Forests

*This method of forest creation is not a replacement for our natural forests, but rather, a means to reforest urban and ecologically degraded landscapes that can in turn provide many benefits.*

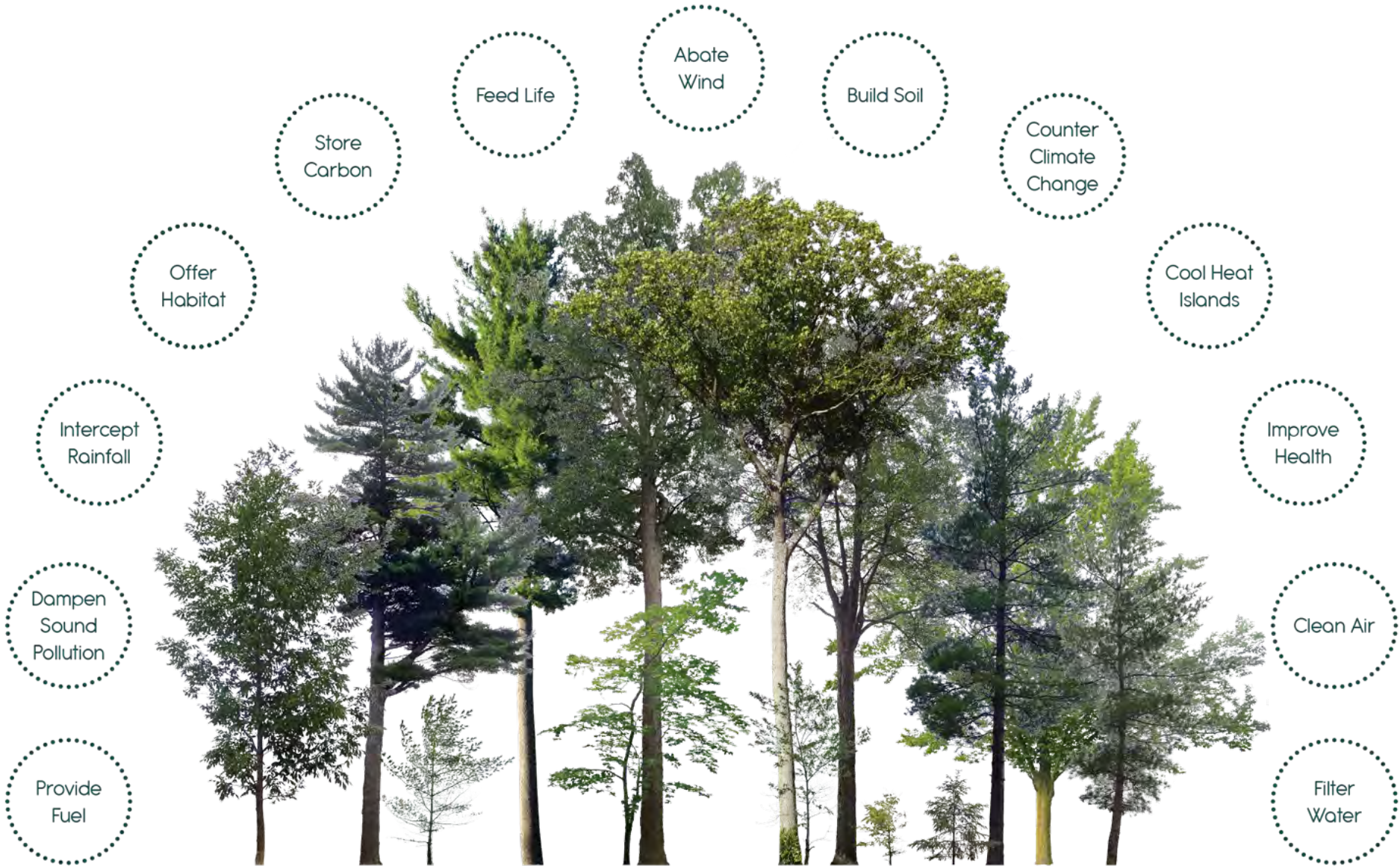
### Welcome to Mini Forests

A **Mini Forest** - also known as a micro forest, tiny forest, pocket forest, or little forest - is a community of native trees and shrubs planted tightly together in an urban or suburban site based on the **Miyawaki method**. This method was first developed in Japan by the late botanist Akira Miyawaki, and has since been adopted across the globe, helped along by [Shubhendu Sharma's TED talk](#) on Miyawaki forests in 2014.

This method of **reforestation** allows for the transition from neglected spaces or from lawns to pockets of forest, which can be achieved in spaces as small as 100 square metres. This method emphasizes the use of dense plantings, diverse locally native species collections, soil preparation, and multilayered design to mimic the complexity of a native forest. These communities of trees and

shrubs connect with one another through underground **mycelial networks** (Simard, 2009). The dense planting method encourages vegetation to grow upward instead of outward, resulting in taller plants in a shorter time. Mini forest plant communities offer improved air quality (Nowak, Hirabayashi, Doyle, McGovern, & Pasher, 2018), mitigate surface stormwater runoff (Berland, et al., 2017), counter heat island effect (Edmondson, Stott, Davies, Gaston, & Leake, 2016), provide habitat, and reduce noise pollution (Maleki & Hosseini, 2011) in urban and ecologically degraded settings. While the Miyawaki method for creating Mini Forests is an emerging technique for Canada, it has been successful in Japan and other parts of the world for over 40 years (Miyawaki, 1999).

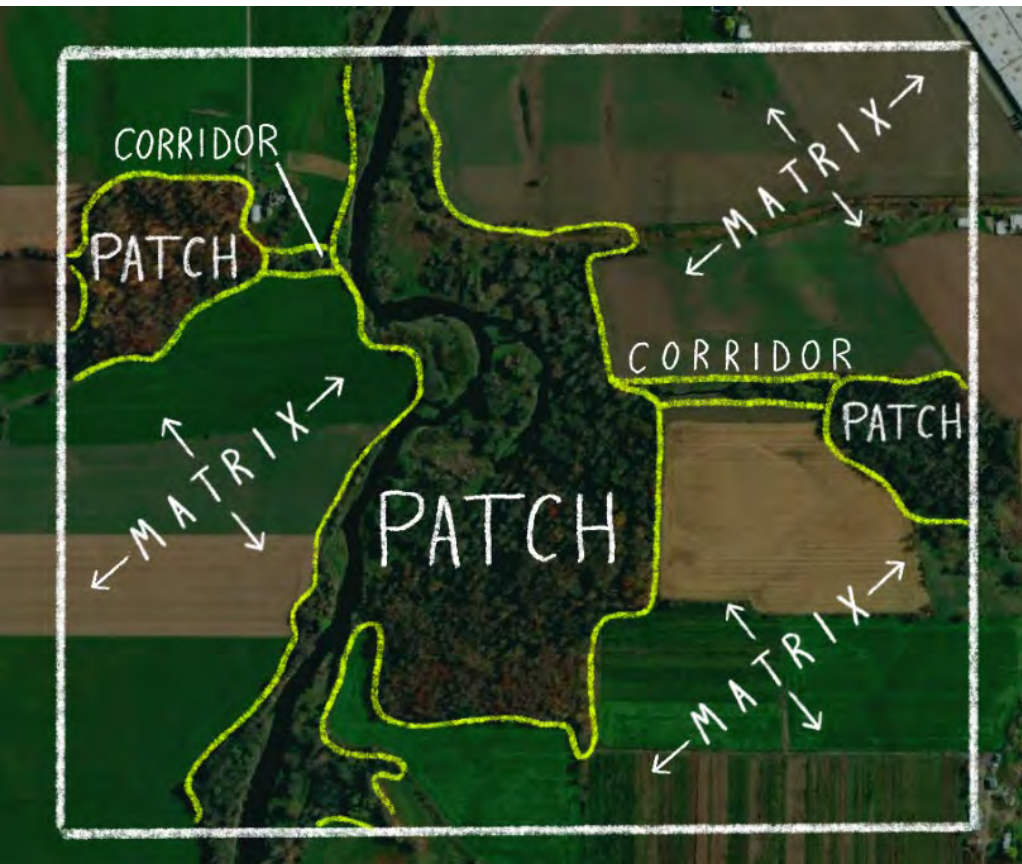




Dougan & Associates

## Landscape Ecology

Your Mini Forest may seem small, but it's an important piece of a much larger interconnected system of forests and other natural habitats across the landscape. Thinking about our natural habitats within the context of the larger system helps us to plan our land use



*In highly modified landscapes, the dominant land cover (matrix) is often anthropogenic. Mini Forests can help improve the landscape composition by increasing the patch and/or corridor size of forest habitat. Image courtesy of (Fischer & Lindenmayer, 2007). Source, Dougan & Associates*

and manage our environmental resources wisely.

There are many ways to conceptualize landscapes, but one simple and effective model for thinking about those that have been highly altered by humans is the **Patch, Corridor, and Matrix Model** (Forman, 1995; Perlman & Milder, 2004).

This model says that a particular landscape will have a dominant land cover type known as the **Matrix**. Within this matrix are **Patches** of different land cover types that are connected by linear **Corridors** that allow for species movement between patches.

For example:

*An urban area will have an anthropogenic matrix (think roads, buildings, etc.) with patches of remnant natural areas like forests. Waterways and their buffers often provide corridors for species to move between patches.*

*A rural area often has an agricultural matrix with patches of remnant natural areas. Corridors for species movement may be waterways and their buffers and naturalized hedgerows around fields.*

In human-dominated landscapes such as these examples, existing habitat patches and corridors provide critical refuges for wildlife and contribute to the **ecological services** of a place. Conservation efforts in such areas focus on improving a landscape's ecological health by restoring existing degraded patches and corridors or creating new ones. Mini Forests assist these efforts by adding forest habitat into anthropogenic matrices and creating more space for species to live and travel through.

*“The beauty of restoration is that it conveys a message of action and hope, and it can happen at any scale – whether a backyard plot, a city park, a river valley, a national forest, or a globally threatened ecosystem. This means that everyone can get involved.”*

*~ The United Nation’s Becoming #GenerationRestoration Report*



## Section Two: Funding and Professional Assistance

You may have a site, you may have the volunteers, but it is likely that you will need some funds to cover costs for plants, mulch, compost, and/or professional expertise. Depending on your approach, you may want to skip to [Section Three: The Plant Part](#) and then return to this should you need guidance with funding. This is a bit of a chicken and egg, for you will know how much funding you need once you have a completed materials list, however, your materials list may be governed by the funds you have available. A costing spreadsheet is available through the mini forest hub ([networkofnature.org](http://networkofnature.org)).

### Funding

From our experience, a mini forest planting can range in cost anywhere from \$3000 to \$30,000! Determining the cost of your mini forest, and securing funding is one of the first steps in the planning process. This includes time, equipment, materials, and services. However, this cost can increase significantly if your site requires protective fencing, or your site hosts desire additional landscaping features or stormwater infrastructure. It's important to clearly communicate with your site hosts and partners what services, equipment, and materials your organization can or cannot provide. Anything over and above this budget will require additional fundraising efforts.

You can make requests to businesses for donations of equipment materials or services, but you might also need additional cash donations. There are a variety of funders that you can explore for

funding opportunities. Look for a funder who has an interest in the environment. Even better, look for funders who have specific interests in biodiversity and greening cities. Mini Forest projects can appeal to funders who are interested in pollinator habitat, climate change resiliency, and urban forests. Funding applications can be written so they place an emphasis on these additional attributes if this will be more appealing to funders. There are a few large national organizations and private foundations that offer grants and there are often local grants you can explore at the community and municipal level. Beyond these options, the federal government supports environmental initiatives, which are listed on their [website](#).

As soon as you know you will be planting a Mini Forest you should start looking at the potential funders and their deadlines. Also remember to ask your site host to help secure or even contribute funds. For example, a school may have set aside funds for schoolyard work and have a supportive parent community interested in contributing. If installing a Mini Forest on corporate property, the company should have funds to contribute. Organizations can find funding to support their projects it is usually just a matter of you and your team reaching out to people and funders. It's a fun, unique and community-building event that everyone can get excited about.



## Professional Assistance

Professional assistance is highly recommended! Mini forests are not just a collection of trees and shrubs; they are plantings mimicking forest communities. Here is a list of some essential elements that can easily go amiss during the process:

1. Understand your soil! If you do not feel comfortable assessing the soil texture and drainage patterns, seek out an ecologist, soil scientist, or farmer to determine the site's soil.
2. Know your plants! Compile a plant list based on a reference community. If you cannot identify plants, seek support from a botanist, master gardener, forester, or arborist to identify the plant community AND to inspect the nursery plants. Some nurseries will incorrectly label plants and others may claim non-native species to be locally native.

We offer some guidance in how to assess soils and identify plants in Sections Three and Four, however you may still want to seek out expert advice as you plan your Mini Forest. You'll also need expertise to help with the planning and implementation. In the beginning, you should make a list of all the equipment, materials, and tasks that you'll need to complete the project.

This will help you form a wish list of items and services that you can request from companies and individuals. Some of the services you will require include:

- a landscape architect to help with the site design (especially for paths, site furnishings, signage, etc.)
- a knowledgeable gardener to identify what plants you will need
- a photographer and/or a videographer help document the event
- certified First Aiders

Feel free to add to this list to personalize and make the event fun. You could have an MC, musicians, DJs, or spoken word artists.

## Wrap-up and Evaluation

These projects are important to our community as they demonstrate what we can do when we pull together to create change. They transform urban spaces into lush, more biodiverse places that in turn provide richer areas for our community to learn together. Your Mini Forest will provide a home for trees and shrubs, but also for fungi, wildlife, microorganisms and much more!



## Section Three: The Plant Part

*Disclaimer: It is your responsibility to ensure that you are meeting all legal requirements at each stage of your Mini Forest project. This means consulting with regulatory authorities, obtaining legal permission to use the site you select, providing liability waivers to volunteers, and so forth. This document does not constitute legal advice.*

### Site Selection and Evaluation

#### Site Selection

Selecting a high-quality planting site is the best way to ensure a long-lived, healthy Mini Forest.

The site should:

- have a minimum area of 100m<sup>2</sup>
- receive at minimum 6 hours of direct sunlight (aka full sun)
- have access to water or irrigation for the first three years
- be protected from deer and rodent herbivory
- be accessible to participants responsible for establishment-period maintenance (first 2-3 years) and longer-term monitoring



Mini Forests can be created in a wide variety of sunny open locations, from parking lots to parks. Depending on the property size and type, you may find that you have several potential Mini Forest site options, or you may have just one! In either case, evaluating your site or sites will help you make decisions about how to select and/or optimize your project site.

## Site Evaluation

A site evaluation acts as an inventory of the features, opportunities, and constraints of your site. By understanding these factors, you can make informed decisions about species selection and layout. If you are trying to choose between a couple of different locations, you can also perform a site evaluation for each and then compare to select the best option based on your goals.

Some things you will want to consider when performing a site evaluation include:

- Locates and utilities
- Soils
- Solar exposure and slope
- Precipitation and the water table
- Local forests and ecology
- Sightlines and setbacks
- Desired uses (programming)
- Area for storing plants during planting day
- Shaded area for refreshments and water
- Washrooms
- Access for installation, maintenance, and monitoring

## Choosing Trees and Shrubs for your Mini Forest

Mini Forests consist of locally native trees and shrubs planted tightly together, which means that you will need to select a variety of woody plants for your design. If you are unable to identify plants, or are not familiar with locally native plant communities, seek out an ecologist, botanist, naturalist, arborist, or master gardener who can help you develop a list.

\*Note that Mini Forests constitute **mid- to late-succession** species. That means you should be seeking a reference community that includes **climax species**. Avoid **pioneer** species like poplars and willows.

Look for 15 to 30 different native species that are best suited to the area being planted. You will want to divide the number of species between the four height classes (**canopy, sub-canopy, understory trees, and shrubs**). While variety is important, remember that more is not always better! You should opt for fewer species that are appropriate for your location rather than many species that may not be suitable or survive your site conditions. When looking at the availability of species at local nurseries, keep in mind that the plants can be provided bareroot or in small pots.

## Looking to Local Forests

*“The trees act not as individuals, but somehow as a collective. Exactly how they do this, we don’t yet know. But what we see is the power of unity. What happens to one happens to us all. We can starve together or feast together.”*

— Robin Wall Kimmerer

A great way to determine which species are most suited to your location is to visit a nearby forest that grows in a similar environment to your site (e.g., in a lowland, on a north facing slope, within sandy soil, etc.) and see which species occur there. Nearby parks, conservation areas, provincial parks, and protected woodlots are all great options to explore. Google maps or aerial imagery can help you locate accessible forests. Remember that *forests on private property should only be accessed with explicit landowner*

*permission.* When surveying any site, be respectful and limit any disturbance. In publicly accessible areas, remain on trails and obey signage when present.

If you are unable to physically access a site to identify the species present, or if you are preparing your species list in the winter when tree and shrub identification is challenging, there are a variety of resources that can help you:

- The Natural Resources Canada “[Plant Hardiness of Canada](#)” webpage allows you to enter in a municipality or coordinates to obtain a list of plant species that occur in the area.
- The [My Tree app](#) by the Canadian Forest Service includes more than 180 native and introduced species of trees and shows which tree will grow best where, according to hardiness zone. Be sure to filter for native species.
- [iNaturalist](#) lists species records by area. Scroll to your location and under the ‘explore’ function, filter to ‘plants’ and ‘research grade.’ A list of plant species (both introduced and native) will populate the screen; you can create a long list to share with a woody plant expert who can then advise on which species to include in your mini forest.

## How to Identify Species

*“Knowledge generates interest, and interest generates compassion.”*

*~ Douglas W. Tallamy*

If you are new to identifying plants and are not familiar with species in your area, it can be tricky to learn on your own. Check the [Network of Nature plant people page](#) to find a local botanist, plant society, or naturalist group that might be interested in helping you out. Someone may be willing to accompany you to a local forest and help you identify suitable native species. Alternatively, you could contact your local [conservation authority](#) (in Ontario) for assistance from their ecology department.

There are also several apps available for plant identification if you have access to a smart phone or tablet. [iNaturalist](#) has a built-in species identifier which can help narrow down the possible species. Start a new observation to take a photo with the app or upload a photo after being in the field and select “what did you see?” to see a list of species. Similar apps that may also be useful are the [iNaturalist “Seek” app](#), and [Google lens](#). iPhones with iOS 15 or later will identify plants within the Photo and Camera apps.

Finally, there are hundreds of resources online in addition to field guides available for your province, territory, or region. A quick online search for “trees of Ontario” or “trees of Alberta” is sure to turn up multiple results of helpful webpages with simple ID guides.



## Budgeting, Sourcing, and Ordering Materials

You have a site selected! You know which species you want to plant! Now you need to budget for and source your plants and site materials.

### How Many Plants do I Need, and of What Size?

For every square meter in your Mini Forest, you will need 3-5 plants representing a combination of canopy trees (1), subcanopy trees (2), small understory trees (3), and shrubs or woody groundcovers (4) (**height classes**). Multiply your site area (in square metres) by 3, 4, or 5 to determine how many plants you will need. Once you have the total sum of plants, divide that number by 4 to determine how many plants of each height class you will need. You will then need to allocate numbers to each species within each height class to ensure there is even representation between canopy trees, subcanopy trees, small understory trees, and shrubs.

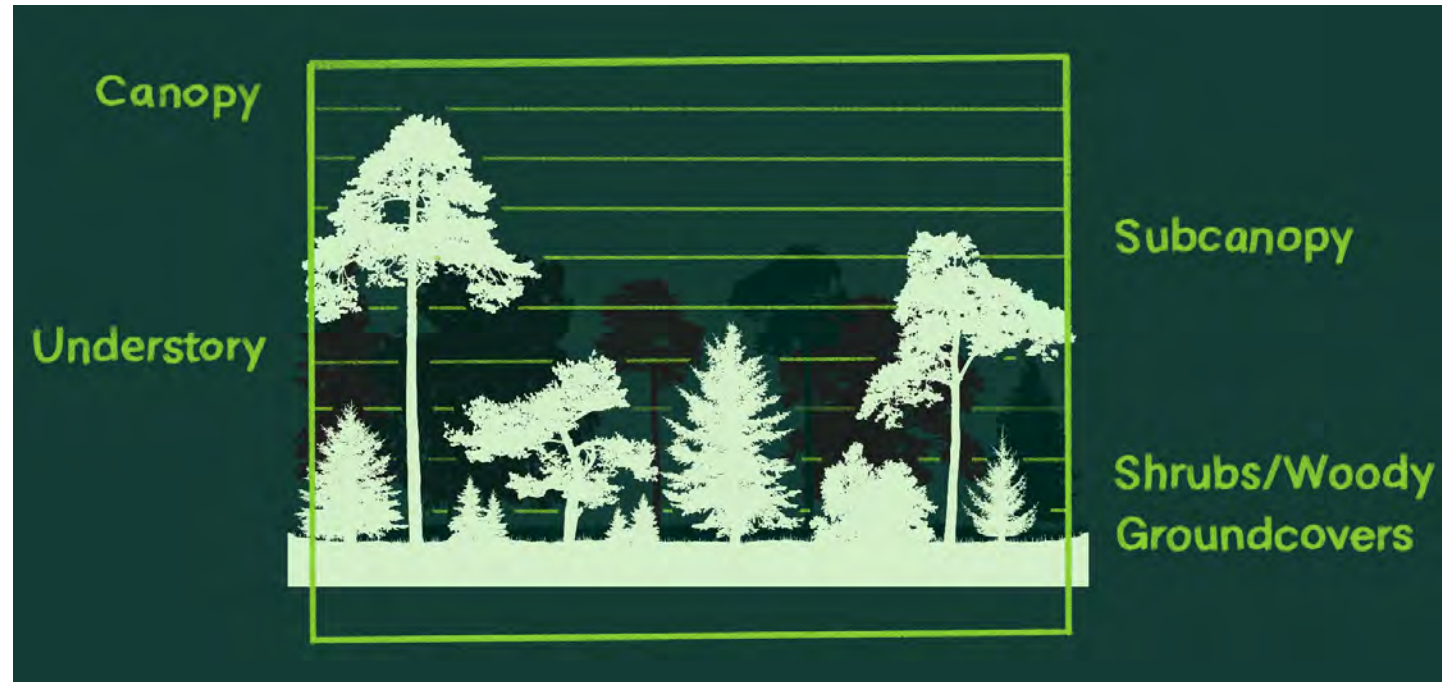
**Total # of plants:** *Site Area (m<sup>2</sup>) x number of plants (3,4 or 5) per (m<sup>2</sup>)*

**Plants per height class:** *Number of Plants / 4*

### Sourcing Plant Material

Once you have determined the types and quantities of trees and shrubs for your Mini Forest, it is time to source your plant stock.

Note that while it is a good idea to have a clear list of which species and how many you will need, remember to be flexible! Some species are rarely grown in nurseries—in such cases, be open to substituting with other native species that have similar features to your first choice, or merely increase quantities of other species from



your list that are readily available. It may be necessary to source stock from multiple nurseries to find all the species you wish to include in your forest in the quantities you require. Nurseries also have different availability depending on the time of year, so planning well ahead will work in your favor.

**Size matters!** Try to avoid planting larger nursery stock. The best sized plants for Mini Forests range from plugs (1 year old seedlings) to 2-gallon potted whips. Larger plants take longer to recover from transplant shock, require more energy to transport, command larger planting holes, and cost more.

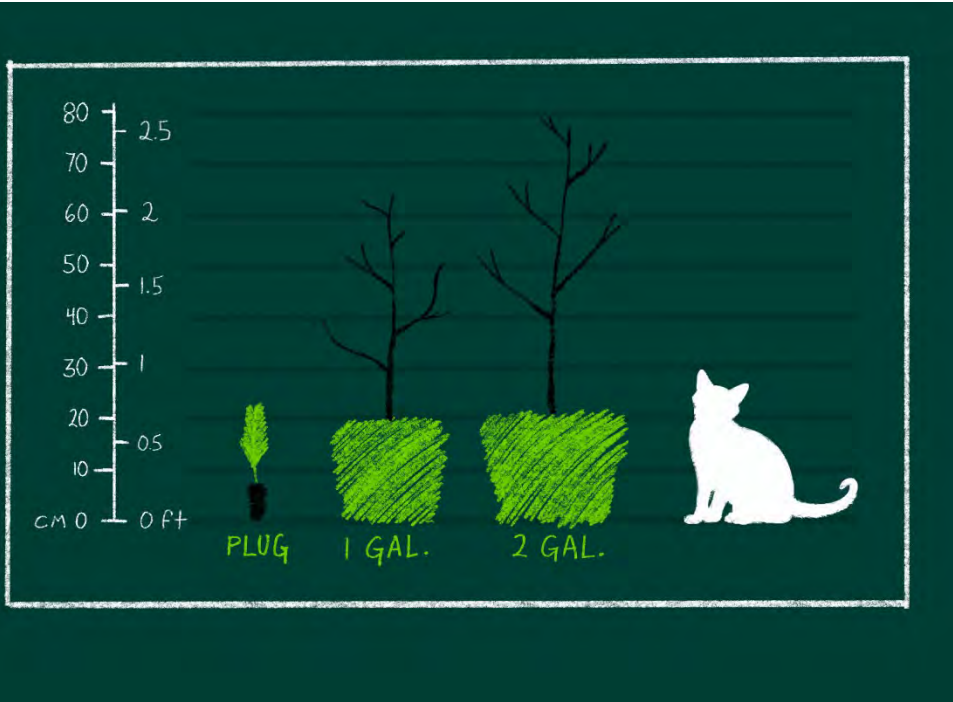


Figure 2: Recommended standard nursery stock sizes for mini forests. Seeds and bare root plants are also well suited to mini forest plantings.

### Where to buy

[Network of Nature](#) has compiled an extensive database of nurseries and plant providers across Canada that offer a selection of native plants and seeds. The North American Native Plant Society also has a vetted list of North American (Canada and USA) growers [available](#)

[here](#). It is important to research nurseries near you and find one that will fit your needs (for example, some nurseries have retail locations while others are only open for wholesale orders).

When you contact a nursery, some important questions to ask are:

- How many of any given species will they be able to sell you?*
- What condition (e.g., potted, bare root) and size plants are available?*
- What is the cost per plant? Are they able to offer wholesale prices for your order?*
- Is there a minimum order?*
- What is the cost for delivery (in the case of large orders)?*

### Salvaging saplings

If you are aware of native plants slated for removal, either due to proposed development or because they are undesired by the landowner (e.g. seedlings growing in vegetable gardens or suckers spreading into grass), *with the landowner's explicit permission*, you may opt to transplant these young trees and shrubs in your mini forest. Note that it is important to properly identify these plants and especially in urban areas. Many introduced European and Asian trees and shrubs readily reproduce in our cities, suburbs, towns, and villages.

### Sourcing and Germinating Seeds

Another option for sourcing materials for your planting site is to collect seeds. This method can be time intensive but less costly than purchasing trees and shrubs to plant. Ideally, seeds will first require stratification, and then be planted in pots 1-2 years in advance of the forest installation, so they can germinate and grow before planting. This method is beyond the scope of this document, however there are some wonderful resources available for seed collection and plant propagation available at [networkfornature.org](http://networkfornature.org).

## Site Preparation

It is advisable to prepare your site well ahead of your planting day, or even before you select and source plants. Depending on how you prepare your site, optimal timing may be a few weeks or a few months in advance of planting! For fall planting, prepare your site in the spring. If planting in the spring, prepare your site in the fall. If timing is tight, you can prepare your site closer to your planting event (we had to prepare one of our sites on planting day). The more time you give it to incubate, the easier it should be to dig and install your plants.

### Step One: Outline your Site

Using spray chalk, flags, or rope, clearly delineate the boundaries of your Mini Forest. This is especially important if you are enlisting the help of volunteers! Don't forget to take a few photos of your site- these will be your 'before' images!

#### Materials:

- Measuring tape
- Rope, string and pegs, or spray chalk
- Camera

### Step Two: Prepare the Ground

Remove any deep-rooted weeds, woody plants, rocks, or debris from within your plot. Dispose of yard waste appropriately (please refer to municipal yard waste protocols). The following methods for preparing the soil are based on results from your soil testing.



## METHOD A: Undisturbed Soils (not compacted)



If your soil still has an original intact **A horizon** (top, typically darkest layer of soil) and hasn't been graded or compacted, your soil is undisturbed and won't require intrusive soil prep before planting. Soils that have been farmed, subjected to fire, or logged but not graded, and natural forested land are considered as undisturbed. Soils within residential areas that predate the 1970s are also considered undisturbed.

### Option 1 – Smothering existing vegetation

Once you have removed deep-rooted weeds like dandelion and wild carrot, mow the remaining vegetation and leave the cuttings in place. Proceed to cover the entire site with cardboard (remember to remove all tape)! The cardboard sheets can be overlapped to reduce growth of the existing vegetation. You may want to move on to the next step immediately, since cardboard can be blown away when not secured. If your site is on a slope, you may want to peg or stake the cardboard in place. For steeper slopes, you will need to follow Option 2.

### Option 2 – Removing existing vegetation

With a sod stripper, sod cutter, or shovels, strip the upper most layer of soil (that contains the grass and most surface roots). You can install, or offer these **sod mats** to others to use, in areas reserved for lawn, or you can compost. Ensuring the residual soil surface is roughened, you are ready to move onto the next step!

### Materials:

- Weeder or weed removal tools
- Craft cardboard or commercially available [biodegradable weed barrier](#) (tape free, few/no dyes)
- Pegs or stakes
- Lawn mower
- Sod stripper, sod cutter, or shovel

## METHOD B – Compacted Soil

Undisturbed/uncompacted soils are made up of 50% minerals/organics and 50% air space. When soil is compressed and loses air space, it becomes compacted. Activities that cause compaction include foot traffic (think paths), working wet soil, repeated tilling, and rainfall on exposed soil. The best way to counter compaction is to inject the soil with some compost! This will draw life back into the soil (it is food for microbes), which will then re-aggregate the soil thereby air-pockets.

Excavating living soils (undisturbed, un-compacted) disrupts the soil ecology with negative effect to the micro and macro-organisms that call the soil their home (Helgason, Walley, & Germida, 2010). However, if the soil has been compacted and is not supporting much life, it will require some excavation and amendment before planting your trees.

First determine how deep the compaction extends within your soil. If the compaction is only within the first 15-20 cm (6-8 inches), you can use a rotary tine tilling machine, roto tiller, or spade tiller. Compost can be added at the time of tilling. It is important to AVOID tilling wet/saturated soil, as this will cause further compaction! Likewise, it will be challenging to till if the soil is very dry, so aim to till when the soil is a bit moist.

If compaction extends beyond the first 15-20 cm (about 8 in), it is advisable to excavate down to the depth of compaction but no more than a metre. Do not excavate beyond where the compaction occurs. Amend this soil with the compost representing approximately 10% of volume (this is equivalent to placing ~10 cm (4 in) of compost over the planting area). This will need to be performed with machinery like a backhoe. Once the soil/compost blend is returned to the excavated hole, cover the entire planting area with 10 cm (4 in) of mulch. Jump to step four.

## Materials:

- Soil amendment (see list of options in the glossary)
- Mulch (see list of options in the glossary)
- Shovels
- Roto tiller, rotary tine tilling machine, spade tiller (for superficially compacted soil)
- Backhoe and/or excavator (for deeply compacted soil)



### METHOD C – Degraded and Heavily Compacted Soil

The Miyawaki Method promotes excavating the first metre of soil. This soil is then amended with a combination of materials that promotes better water retention, aeration, and nutrients. If your site is within a parking lot island, was depaved, exposed to toxins (salts, excessive pesticides), or has a history of severe erosion and compaction, Method C – the Miyawaki Method approach – is recommended.

Excavating to a metre in depth is highly disruptive to soils – unless they are dead and depleted of organic matter. Typically, it is advisable to avoid mixing soil horizons, but in the case of heavily degraded soils, there is often a lack of horizons. This method is expensive and energy intensive. It is only advised in extreme situations. Note that Miyawaki method practitioners from India and the UK are now considering revising the 1m deep excavation recommendation.

A step-by-step document is available for sale on the Afforestt website. The soil amendments recommended by Afforestt are not necessarily appropriate for, nor available within, the Canadian context.

**Aeration:** Shredded leaves, chopped straw

**Moisture Retention:** Biochar, coco coir

**Nutrients:** Aged manure, compost



*Top to bottom: Excavation, combining amendments, redistributing amended soils to excavated pit (courtesy of Afforestt).*



### Step Three: Compost and Mulch

With the cardboard in place, vegetation removed or soil recently tilled, begin covering the site with a **soil amendment** like compost, aged manure, composted leaf mulch, and/or biochar. If you covered with cardboard, it is best to moisten the soil amendment so that the cardboard is secured against wind and microbes begin decomposing the existing vegetation and cardboard. Your soil amendment should be applied to a depth of 100-120mm (3-4"). Finally, spread the **mulch** over the entire site, ensuring it is approximately 120mm (4") thick. Adding mulch can prevent the growth of weeds, help retain moisture, keep the soil cool during summer, and act as insulation in the winter.

#### Materials:

- Soil amendment (see list of options in the glossary)
- Mulch (see list of options in the glossary)
- Shovels
- Wheelbarrows
- Buckets
- Water
- Ruler

### Step Four: Let it Rest

Let the mulch and compost sit for a season to allow them to decompose and release nutrients into the soil. This is especially beneficial if you have opted to smother the existing vegetation. As that vegetation decomposes, it will release nitrogen, and as the cardboard decomposes, carbon will be released into the soil. These are added nutrients in addition to what the compost will provide for your plants.



## Planting your Mini Forest

This section describes considerations with your plants. For information about managing the planting event, see Section 3: The People Part.

### Receiving Your Plants

Ahead of your planting day, coordinate the pickup or delivery of your plants from the nursery or nurseries you ordered from. The type of plant stock you have ordered (bareroot or potted), the weather, and how far ahead of your planting day you receive the plants will determine the kind of care they need. In general, plants should be well-watered and kept in a shaded or partially shaded area until you are ready to plant them. Bare root plants are typically provided in moist bags and should be kept in a cool place. If they must sit for more than 24 hours before planting, dig their roots into some soil and moisten them (this is called 'heeling them in'). It is best to plant bareroot before buds break or after leaves have dropped. They are ideal for planting during the dormant plant period. If heeling bareroot plants, ensure the roots are covered but that the stems are not! Covering stems with soil can lead to rot. Heeled in trees can be stored for several months, but it is best to plant them within a couple weeks of receipt to avoid them breaking dormancy.

Remember it is important to allocate a location for storing the plants! If plants are to be left overnight in a publicly accessible area, consider securing them with fencing or storing indoors. There should also be a designated area for compost, mulch, shovels, wheelbarrows, and buckets. Further designated areas are listed under Section 3.



*Source: Plant Me Green Bare Root Trees.*

### Organizing Your Plants

Plants can be organized by height class or by square metre groupings. This requires arranging them in groupings or colour coding the pots with stickers or spray paint. Mycorrhizal inoculant or prepared compost tea can be added to each planting hole at the time of planting.

Now remember that plants should be well-watered ahead of planting!





### Step 1: Layout

Trees and shrubs should be planted in a semi-random pattern to mimic how forests naturally grow. There are four height classes to fill the vertical space, so it is important to stagger the canopy, subcanopy, understory, and shrubs throughout the planting area. Do not group by species—for example, if you have several hemlocks, space them out throughout the Mini Forest. There are a few ways to support random, but evenly distributed height classes. This step can be done with a core team of volunteers or by the organizers:

1. Position each plant before planting
2. Stake coloured flags that correspond to the colour coded pots
3. Assemble clusters of potted plants for each square metre. Volunteers can then grab them during planting time.

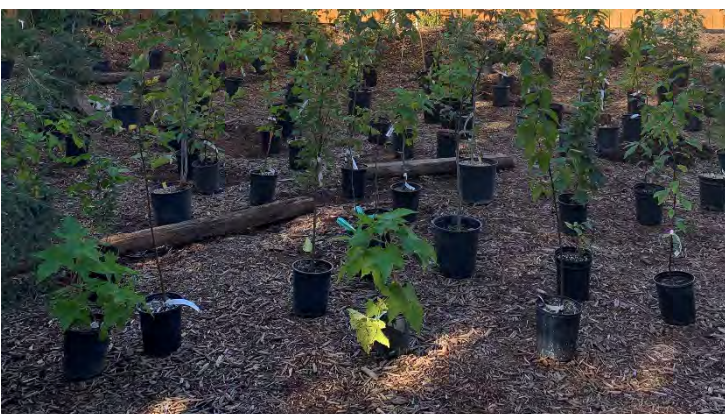
### Step 2: Dig Holes for Each Plant

Move the mulch aside ahead of digging each hole.

**If you are using container-grown plants:** Dig a hole 1-2 times as wide as the container. Digging the hole wider than the container will ensure that there is room for the root system to grow through the loosened soil (Malloy, 2022).

**If you are using bare-root plants:** Dig as deep as the deepest root (usually the tap root). Dig the hole as wide as the roots spread horizontally when stretched from the base of the plant.

Whether you are using container-grown or bare-root plants, ensure that each planting hole is deep enough so that **the root flare** (base of the trunk where the roots begin) **is level with the top of the hole**. It is better to plant too high than too low! Trees, like humans, need air to breathe. If planted too deeply, the tree can suffocate. Follow the diagram below.



Wrap plastic perforated spiralled strip (spiral guard) around the lower portion of the trunk.

Root flare must be at grade, not below!

Construct soil berm around the root ball. The berm should be 120 mm (4") tall and 240 mm (8") wide.

Sides of loosened soil should be sloped.

Existing soil.



Stake only if absolutely necessary. Position stake upwind from sapling. Ensure roots and branches are not damaged by install.

Roots to be spread out just below final grade. Dig hole deep enough to accommodate taproot if present.

Prior to mulching, lightly tamp soil around the root zone by hand. Do not over compact. When the planting hole has been backfilled, pour water around the roots to settle the soil.

120 mm (4") layer of mulch. No more than 30 mm (1") of mulch on top of root ball.

Finished grade.



### Step 3: Prepare the Roots

If you are using container-grown plants: Loosen roots from the container by massaging or gently shaking. Massage the roots so that they are not circling the tree and help the roots to spread out in the soil.

Circling roots from potted stock must be teased apart, otherwise, they will continue to grow in a circle, thickening over time, which can lead to strangulation of the root system and inadequate stability in the soil.

If you are using bare-root plants: Carefully untangle roots just ahead of planting. If any parts of the roots are dry, spray with a misting water bottle or dunk in a pail of water.

### Step 4: Place Plant and Fill the Planting Hole

Place the plant in the center of the planting hole, ensuring it is upright. Start filling in the hole with the loose soil and break up any large clumps of the soil before putting it back in the hole. Press firmly to ensure there are no air pockets around roots. Tug the plant gently to make sure it is snug in the ground. The hole should be filled so that it is flush with the ground. Most roots should be placed just below the surface of the soil! Think of a tree's form like a wine glass on a dinner plate: Tree roots typically grow outward and straight, just below the surface (where rain and most nutrients are found). Let's try to mimic that growth form as best as possible when planting! Tap roots (like a carrot) should be aimed downward.

### Step 4: Water and Mulch

Each plant should be well watered immediately after it has been planted. Saturating the disturbed soil with water will give the roots the jump start they need to start growing! Plus by filling the recently dug hole with water, you will remove any remaining air pockets.

Mulch or re-mulch the planted site . See [Watering Your Mini Forest](#) for more information about watering.



*Small circling roots will continue to grow in a circle all the while growing thicker. This may eventually choke the tree. Lower photo shows the comparison of how roots grow in a container (circling) and when left to spread naturally (straight and away from the trunk. It is important to sever or pull these circling roots when planting.*

*Source: Ed Gilman and Brian Kempf [www.urbantree.org](http://www.urbantree.org)*

## A Note on Mulching

The proper use of organic mulches for trees and shrubs provides many positive benefits

- moderation of soil temperature and moisture
- weed control
- prevention of mower injury
- aesthetic value
- addition of organic matter and
- enhanced microbial activity

However, too much mulch can cause a lot of problems. Make sure to keep mulch pulled back 6 inches or more from the trunk, and limit mulch depth. The recommended depth of organic mulch depends on soil type and mulch type but should not exceed 4 inches. Once your mini forest is established, it will provide its own mulch in the form of fallen leaves!

## Maintenance

Your Mini Forest will need dedicated care to ensure that it remains healthy. Designating a “plant care” team to help water, weed, and mulch the garden for at least 3 years after planting is a fantastic way to make sure your project gets the care that it needs to be successful!

## Watering Your Mini Forest

Watering newly planted trees for the first few years ensures proper root establishment. Follow these tips for watering:

- Aim for infrequent deep soaking over frequent light watering of your mini forest.
- If using a hose, water low and slow for about 15 minutes on a slow trickle.

- Avoid watering at the base of the trunk, which can cause rotting. Watering either in the morning or in the evening is best.
- A good rule of thumb is to check the soil’s moisture by pressing your finger into the soil by an inch or so. If it is dry, it is time to water. If it is moist or wet, wait until it has fully dried before watering again.
- After the first year of growth, water as needed; during droughts or heat waves.

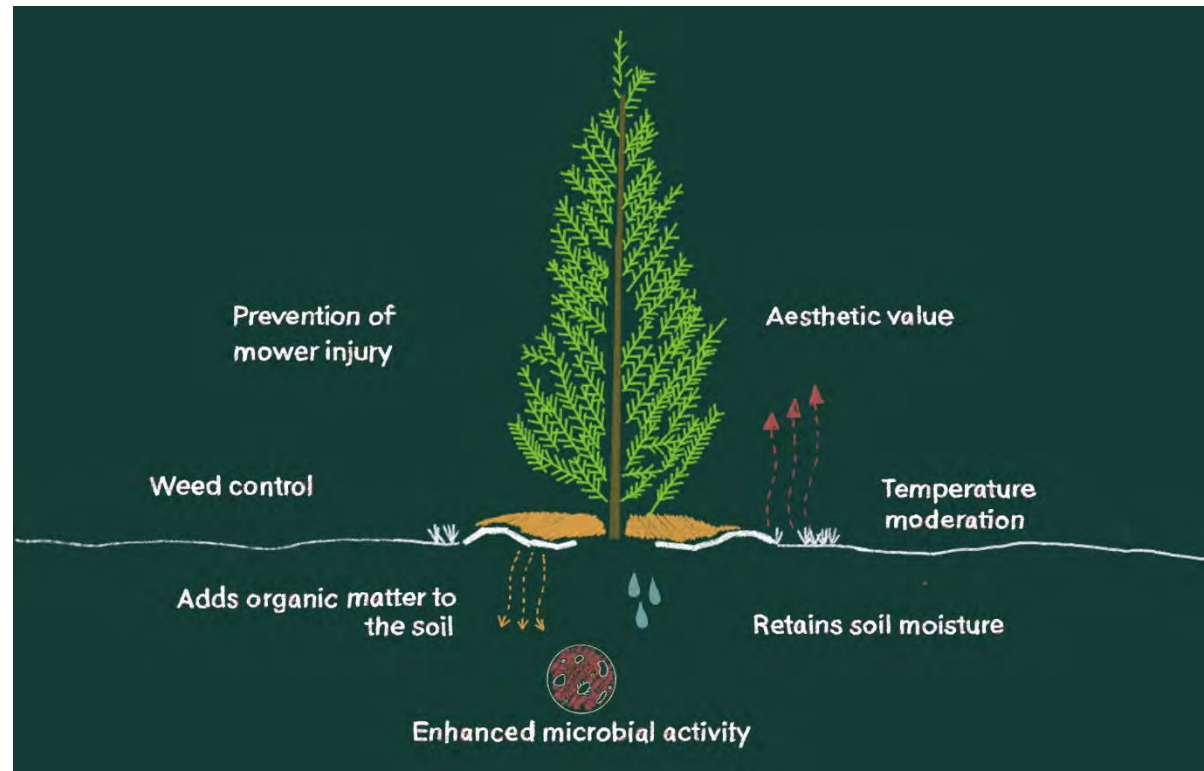


Figure 4: Benefits of mulch

## Removing Weeds in your Mini Forest

Removing weeds is especially important early in the life of your mini forest: weeds can outcompete young plants. Remove weeds periodically throughout the growing season and re-mulch your mini forest in the spring and fall to prevent weed growth.

## Forest Protection

### Fencing and Physical Barriers

Young trees and shrubs are appetizing meals for rabbits, deer, and voles. Although they may not nibble your forest during the growing season, they will when food is scarce during winter and early spring months. If you have any of these animals in your area, it is recommended that you protect your forest with any of the following:

- Spiral guards
- Deer exclusion fencing
- Rodent repellent (like Skoot or Xcluder)
- Hardwire cloth around coniferous trees



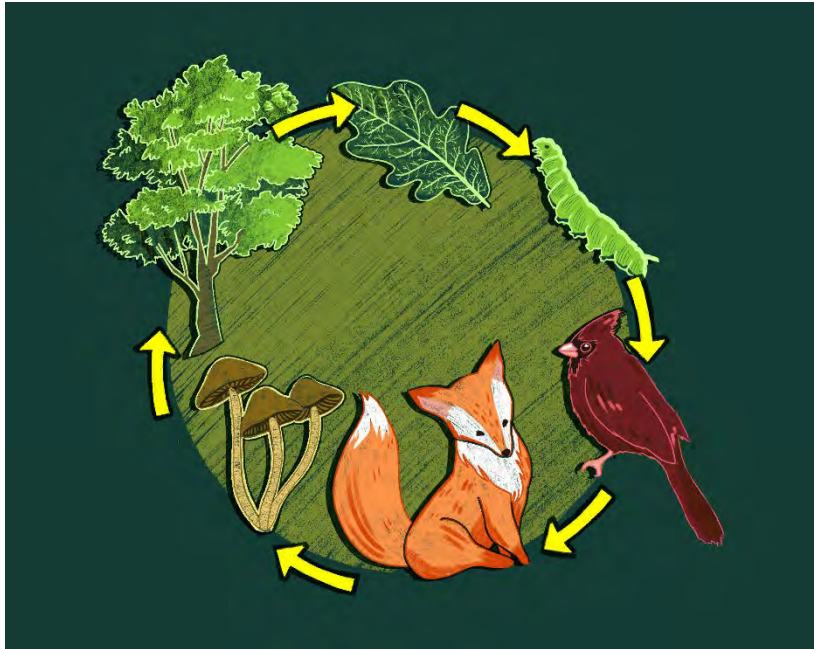
## Chemical Pesticides & Fertilizers

It is much safer to build a healthy plant community by nourishing your forest instead of relying on chemical pesticides. Diverse and healthy plantings typically do not succumb to pests. Albeit invasive species like the spongy moth shouldn't be ignored, as they can fully defoliate mature forest stands.

*“The earth's vegetation is part of a web of life in which there are intimate and essential relations between plants and the earth, between plants and other plants, and between plants and animals. Sometimes we have no choice but to disturb these relationships, but we should do so thoughtfully, with full awareness that what we do may have consequences remote in time and place.”*

~ Rachel Carson

One of the primary objectives to planting diverse native plant communities is to support biodiversity. This is best achieved by planting native host plants and encouraging the native insects they support to feed. Then, before a butterfly relies on nectar for survival, they are a caterpillar needing to consume plant matter. Welcoming insects back into our landscapes provides a wonderful learning opportunity; by introducing children and adults to the diversity and importance of insects, we can begin to rebuild relationships with our non-human kin. Over time, the arrival of insects to your forest will be cause for celebration, as their presence signifies a success in building biodiversity!



Learn the insects that visit your mini forest- if they happen to be an invasive species, follow best management practices on how to remove, or arm your forest with healthy soil and hydration during dry periods. Most insects are beneficial and should be welcomed as our neighbours.

Avoid the use of chemical fertilizer. Chemical fertilizer can cause nutrient runoff, which harms local waterways. Adding compost and mulch to your site is a natural way to enhance soil composition (see *Site Preparation* and *A Note on Mulching* for more information).

### Humans and their Pets

Humans can sometimes be the biggest pest, especially when planting Mini Forests in urban areas. If possible, install a temporary fence around your Mini Forest. Educational signage is another great way to minimize unwanted human encroachment in your Mini

Forest. If dogs are a concern, fencing the site until the planting has filled in is recommended.

## Section Four: The People Part

Community engagement is a key piece of creating a resilient Mini Forest. While planting the forest itself is the primary goal, sharing the process with others has many benefits such as increasing interest in the local landscape, improving local ecological knowledge, and ensuring that the project will be well cared for. Engaging communities in the process also equips them with mini forest knowledge they can share with others, thus amplifying your project's impact.

Engaging the community provides an opportunity for community members to contribute their expertise to your project, which can reduce costs and improve community involvement (See *Planning Committee* and *Section Four: Funding and Professional Assistance*).

## Healing Forests

In response to the [Residential School Truth and Reconciliation report](#) released in 2015, the [National Healing Forest](#) initiative was created to support the development of forested healing spaces across the country. This initiative is an invitation to Indigenous and non-Indigenous communities, institutions, and individuals to create green spaces across Canada to honour residential school victims, survivors, and their families, as well as murdered and missing Indigenous women and girls, and children who have been or were removed from their families.

We encourage you to engage with both local Indigenous and non-Indigenous communities to incorporate the healing forest process into the Mini Forest planting! Combining the Mini Forest planting with the National Healing Forest Initiative informs the process: Before Reconciliation comes Truth, and it is the sharing of stories

and experiences (truth) between Indigenous and non-Indigenous communities that begins the process of reconciliation. Should you want to incorporate this process into your Mini Forest, engage with your local Indigenous and non-Indigenous communities at the beginning of the planning process as sharing your truths will inform the design and implementation of your Mini Forest.

The goal is for communities and individuals to work together to create a healing forest space. It might include outdoor gathering spaces, walking trails, or plots dedicated to growing sacred plants and trees. Visiting Elders might present stories, and survivors and their families could share their experiences. Each community or individual decides for themselves what their healing forest would look like and how it would function. The only proviso is that the forest is created and used in the spirit of reconciliation, healing, shared understanding, and respect. You can find more information at the National Healing Forest Initiative website: <https://www.nationalhealingforests.com/>.

## Partnering for a Project Location

Partner up! This is a wonderful opportunity to meet neighbours, local community groups, the First Nation whose traditional lands the Mini Forest might occupy, and like-minded individuals! For example, schools, churches, and social service organizations are great options as they often have mandates to care for their properties and/or improve the community. Reach out to various groups to determine which will be the best fit for your project and share information with them so that they can learn about Mini Forests, too! Reaching out to municipalities and conservation agencies might also manifest into a mutually beneficial partnership.

## Hosting a Planting Event

A wonderful way to bring your Mini Forest plans to life is to host a planting event. If your Mini Forest site is on public or institutional land (like a school or church property), engaging classes or community groups can not only make for a fun day of planting, but also increase interest in the project and help engage those involved in the long-term care of the Mini Forest (see *Maintenance document at networkofnature.org*). If your project is on your own property, engaging family or neighbors is an excellent option.



National Healing Forest



## Planting Event Participants

One of the essential tasks of coordinating an event is engaging and recruiting partners and volunteers. How you plan your event will depend on the type of groups you are engaged with. For example, if you are engaging neighbours, handing out flyers may be the best way to call attention to your event day. If you are working with a class, there is a great benefit to involving the students in the planning process (species selection, forest design, event planning) in addition to the planting event.

Planting a mini forest is a great way to emphasize the importance of greening our cities, supporting biodiversity and capturing rainwater. Mini Forests provide a tangible way for communities to play an active role in improving their local landscape (see *Section One: Overview*).

## Generating Interest

A terrific way to garner wider community support for your planting event is to advertise. Posting to relevant websites and social media channels can create excitement and interest in addition to reaching audiences that may not be able to physically participate. Creating virtual and physical flyers is another way to call attention to your project and event. Ensure you have a clear registration process if you are asking for participants and keep a list of contacts as different individuals and groups reach out (see *Participant Management*). If you are receiving funding or in-kind assistance from businesses or other groups, be sure to refer to them in any materials you generate for your project.

## Event Coordination

### Planning Committee

A great way to ensure community engagement and increase your project's reach is to assemble a planning team of community leaders to help you organize your project. If possible, involve people

with expertise in landscape design, construction, and fundraising (See *Section Four: Funding and Professional Assistance*). This group will not only be intrinsic to planning and ensuring the success of your event but will also be excellent contacts for reaching out to a variety of groups within the community.

Schedule regular meetings with the Planning Committee during the planning phase. You should make sure that they are clear about what a Mini Forest is and what their roles and responsibilities are. If you are partnering with an organization for your project (for example see *Partnering for a Project Location*), be sure to include representatives from their group in the committee.

### Event Manager

The event manager is responsible for overseeing the planting event day. This person should not have any other designated job on the day of the event as they will be focused on ensuring that the event is safe and fun. This person should be comfortable with communicating with participants and having their own contact information shared, as they will be the point-person for communications on the event day. Ideally, this person will be first aid trained.

### Participant Management

Effective communication with your participants every step of the way is key to a successful project. If you are advertising your event, ensure that you provide a clear registration process for ease of communication and to allow you to plan your planting day according to the number of participants you have. Collecting contact information (email and phone if possible) from each participant will allow you to communicate before and after the event. You can also ask some relevant questions, such as how long they will be available for, if they are willing to help with site

preparation and/or tree planting, and if they have any skills or expertise that might be of benefit.

The following is a brief communication schedule for your event:

**One Week Before Event:** Send out a reminder e-mail to the participants. This e-mail should include the date/time/location of the event, contact information for the Event Manager (see *Event Manager*), as well as health and safety information such as the importance of closed-toe shoes, sunscreen, etc. Also remind them to bring reusable mugs and water bottles and indicate any refreshments that you will provide. Include an overview of the event's schedule and any other information relevant to your event.

**One Day Before Event:** Re-send the above email. Remember to call anyone who may not check e-mail regularly.

### How Many Participants do I Need?

On average, children will plant four (4) saplings and adults will plant six (6) during a 2-hour volunteer shift (this includes time for introductions and instructions). The number of volunteers (beyond your core team) will depend on the number of trees and shrubs to be planted and the amount of time you have set aside for the planting event. A two-to-three-hour long shift is recommended, as this will offer enough time to plant a few trees without taxing your volunteers with too much work.

### Planting Day

On the day of your planting event, the Event Manager is the point person for communication. As participants arrive, they should:

- welcome them
- have them fill out relevant safety waivers

- help them to select relevant safety gear

Once your participants have assembled, it is important to provide an overview of the day. This is also your opportunity to share the importance of Mini Forests and introduce concepts that participants may not be familiar with (see *Section One: Overview*). Some key points to share include:

- A thank you to participants, funders, etc.
- Locations of amenities (washrooms, food, water, etc.)
- Overview of Health and Safety Protocols (see "Health and Safety Section")
- Overview of the day's schedule.
- Overview of Mini Forests, the property's history, etc.

Remember: "Thank You" is key! Volunteer participants are central to Mini Forest planting events, so ensure that you are communicating clearly with them start to finish and thanking them every chance you get. If they have a great experience, they may become the next Mini Forest champion!

### Materials

For your planting event, you will need the following basic equipment, in numbers that will allow everyone an opportunity to participate:

- Spades
- Shovels
- Gloves
- Wheelbarrows
- Buckets

You will also need the following materials:

- Plants
- Hose/Water truck
- Water & Refreshments
- First Aid Kits
- A tent or shaded space
- Sign up forms and waivers

Additional materials such as tarps, yard waste bags, and water coolers should also be considered. See *Funding* for some ideas about covering the cost of materials.



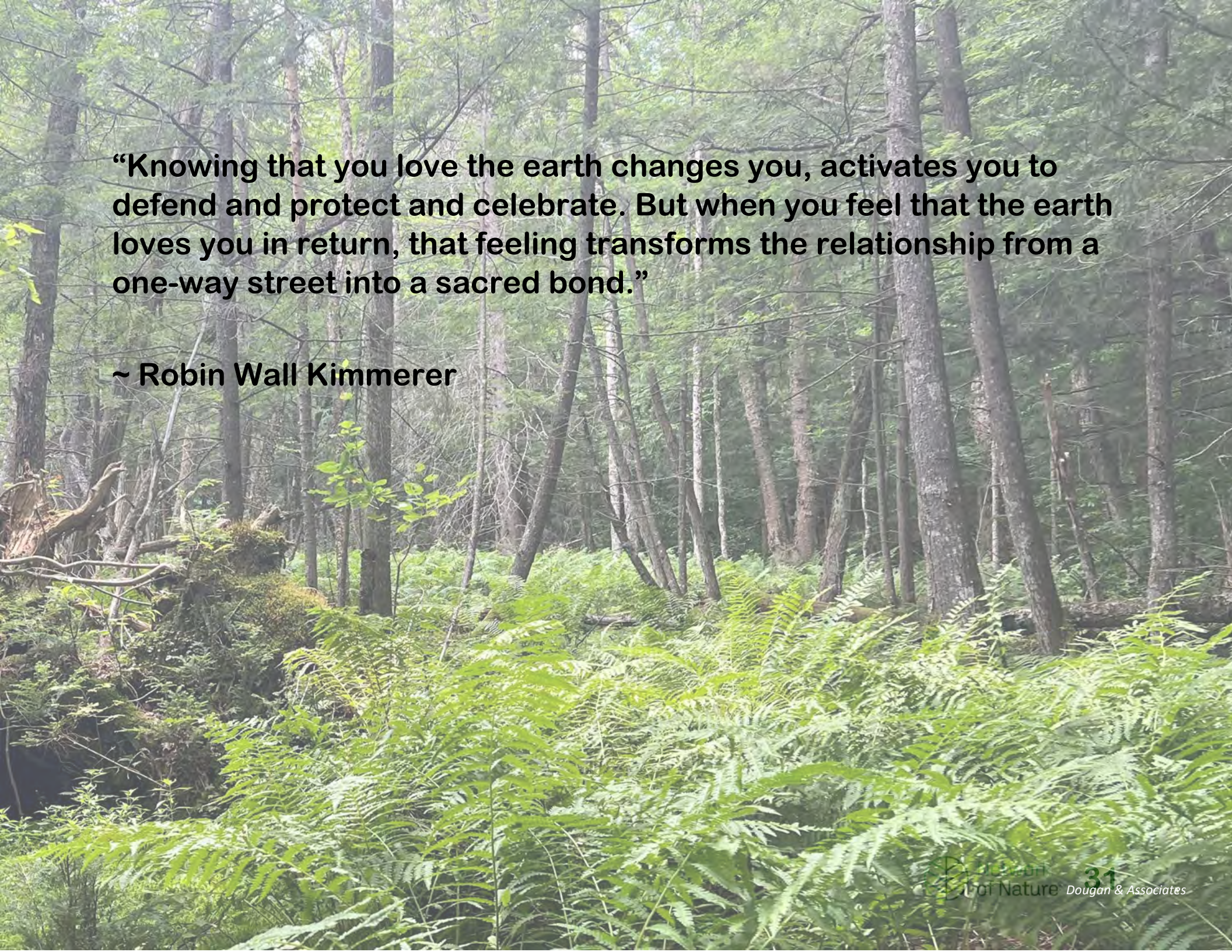
## Section Five: Building Relationships

*“There can be no purpose more inspiring than to begin the age of restoration, reweaving the wondrous diversity of life that still surrounds us.”*

*~ E. O. Wilson*

Planting a Mini Forest is not like building a house, sewing clothing, or creating some other inanimate object, because the forest doesn't degrade with time, but rather, it continues to grow and strengthen as time passes. Planting the forest is the beginning of relationship building, not the end of a project. Although Mini Forests will eventually become self-reliant once established, like children, the young trees must first be nurtured and cared for during their infancy. Spending time with the forest post-planting is one way to begin to rebuild relationship with our non-human kin. Scientists Richard Louv, Michael Vincent McGinnis, and Robin Wall Kimmerer all refer to our sense of “species loneliness” that has emerged from living in societies disconnected from the world that continues to nurture us. As discovered in the [long-term Harvard study](#), connection and healthy relationships are key to happiness. Building Mini Forests is a means to engage community, classmates, and fellow staff. This need for connection extends beyond our human relationships, as demonstrated in several [recent papers](#). Our sense of wellbeing is impacted by our sense of connection with our natural world. Lastly, we have been given many gifts, such as our ability for appreciation, wonderment, and tool making. As Robin Wall Kimmerer reminds us, our gifts are also our responsibilities. It is our responsibility to reciprocate the nurture and care this wonderful world bestows on us.





**“Knowing that you love the earth changes you, activates you to defend and protect and celebrate. But when you feel that the earth loves you in return, that feeling transforms the relationship from a one-way street into a sacred bond.”**

**~ Robin Wall Kimmerer**

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## Glossary

**A Horizon/Soil Profile:** The soil profile consists of 4 major layers or horizons (O, A, B, C). The top horizon of the profile, in an unaltered soil, consists of a thin layer of decomposing organic material called the organic layer. The next layer down is the A horizon. The A horizon contains most of the fine absorbing roots of trees and is very biologically active. The A horizon is primarily built up of inorganic matter (sand, silt and/or clay) but rich in organic matter giving it a dark colour. The B horizon is below the A horizon and is a zone of accumulation. The C horizon is the deepest layer (just above the bedrock) and is composed of partially weathered parent material (Lily, 2010).

Lilly, S., (2010). Arborists' Certification Study guide. International Society of Arboriculture.

**Biodiversity:** The collection of life on earth; the natural patterns that form from all the species of life (species diversity), the genes that each of them possess (genetic diversity), as well as the ecosystems which these species form (ecosystem diversity) (Natural Resources Canada, 2020).

Natural Resources Canada (2020). Forestry Glossary, <https://cfs.nrcan.gc.ca/terms>.

**Buffers:** Buffers are strips of perennially vegetated land which separate developed areas from environmental sensitive areas and lessen adverse impacts of human disturbance (Norman 1998)

Mulamoottil, G., Warner, B. G., & McBean, E. A. (1996). The Use of Vegetative Buffer Strips to Protect Wetlands in Southern Ontario. In

Wetlands: Environmental gradients, boundaries, and buffers (pp. 263–278). essay, CRC, Lewis Publishers.

**Borealization:** A shift in forest composition that favors the emergence of boreal species opposed to temperate hardwood species.

**Carbon Sequestration:** The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release oxygen, and store carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned (Natural Resources Canada, 2020).

Natural Resources Canada (2020). Forestry Glossary, <https://cfs.nrcan.gc.ca/terms>.

**Carbon Sink:** A carbon reservoir that absorbs and stores carbon from another part of the carbon cycle. A sink stores more carbon than it emits to the atmosphere. This store of carbon can also be termed a reservoir or pool. Although a growing forest can be considered a carbon sink, when the forest stops growing and its trees die and start decomposing, it becomes a carbon source, because it emits more carbon than it stores (Natural Resources Canada, 2020).

Natural Resources Canada (2020). Forestry Glossary, <https://cfs.nrcan.gc.ca/terms>.

**Climax:** The climax is considered the final stage of biotic succession attainable by a plant community under the paramount control of climate (Cain, 1939).

Cain, S. (1939). *The Climax and Its Complexities*. American Midland Naturalist, vol. 21, no. 1, p. 146., <https://doi.org/10.2307/2420379>.



**Corridor:** Ecological corridors are passages on land or in water, between a park and the surrounding natural environment. They enable movement of wildlife and dispersal of plant species, and facilitate seasonal migration, reproduction, feeding and adaptation to environmental change (National Capital Commission, n.d.).

National Capital Commission (n.d.). *Ecological Corridors*.  
<https://ncc-ccn.gc.ca/our-plans/ecological-corridors-gatineau-park>.

**Cold Stratified:** Temperature is the most important environmental dormancy-breaking factor among herbaceous seed plants from the temperate region. Most temperate species require a cold winter period prior to germination, or to increase their germination rate, in spring. Cold stratification is the horticultural term for the treatment (method) using cold temperatures, simulating winter, to break seed dormancy (Baskin & Baskin, 1988).

Baskin C.C. & Baskin J. M. (1988). *Germination ecophysiology of herbaceous plant species in a temperate region*. American Journal of Botany, vol. 75, pp. 286–305.

**Cut Test:** Before seeds are collected in the field, some seeds are cut open with a knife or razor blade to see if their internal tissues are fully developed and undamaged (Karrfalt, n.d.)

Karrfalt, R. (n.d.) *Seed Testing*. USDA Forest Service - National Tree Seed Laboratory.  
<https://www.fs.usda.gov/nsl/Wpsm/Chapter5.pdf>

**Ecological Services:** The goods and services provided to people by nature for free: goods such as food, fuel, and fiber; regulating

services such as climate stabilization and flood control; and nonmaterial assets such as aesthetic views or recreational opportunities (Voigt et al., 2013)

Voigt, B., Troy, A., & Johnson, G. (2013). *Mapping the off-Site Benefits from Protected Areas' Ecosystem Services: Final Report*. Retrieved from Ontario Ministry of Natural Resources. <https://www.ontario.ca/page/ecosystem-service-values>.

**Fragmentation:** The splitting or isolating of patches of similar habitat, typically forest cover, but including other types of habitat. Habitat can be fragmented naturally or from forest management activities, such as clearcut logging (Natural Resources Canada, 2020).

Natural Resources Canada (2020). Forestry Glossary, <https://cfs.nrcan.gc.ca/terms>.

**Germinate:** The emergence of the radicle from the seed coat. (Baskin & Baskin, 1988)

Baskin C.C. & Baskin J. M. (1988). *Germination ecophysiology of herbaceous plant species in a temperate region*. American Journal of Botany, vol. 75, pp. 286–305.

**Height Classes:** Mature forests often have four distinct vertical layers. The canopy is where the crowns of the taller trees meet. The sub-canopy sits just below the canopy and consists of slightly shorter and more shade tolerant trees. The understory consists of shrubs and immature trees that grow closer to the ground. Then, finally on the ground layer there are herbaceous species such as ferns, wildflowers, and groundcovers.

**Matrix:** A mosaic may simply be regarded as ‘a pattern of adjacent and connecting landscape units.’ Forman (1996) notes that the pattern includes patches, corridors, and a matrix, but not all these elements need necessarily be present (Francis, 2022).

Francis R., et al., (2022). *Landscape Mosaics and the Patch-Corridor-Matrix Model*. The Routledge Handbook of Landscape Ecology, Routledge, Taylor & Francis Group, Abingdon, Oxon, 2022.

**Mid-Late Succession Species:** Within a biological community there is a predictable sequence of changes in species composition during succession. After a disturbance in a community, there are only a small number of species (early successional species) that can initially establish and thrive. These species tend to thrive in sunny, exposed sites with poor soil quality. As early species establish, they modify the habitat to form slightly healthier soils and some more shaded conditions. This allows other species that are better suited to the new conditions to succeed the early species. Mid-late successional species are the species that establish themselves much later in the successional stages, thriving on richer soils, shade, and protected microclimates. The mid-late species tend to lead toward the climax forest.

**Mini Forest:** also known as a micro forest, tiny forest, pocket forest, or little forest - is a community of native trees and shrubs planted tightly together in an urban or suburban site based on the Miyawaki method

**Miyawaki Method:** A method of reforestation developed by Japanese botanist Akira Miyawaki which is built on the principles of high-density plantings that mimic natural ecosystems

**Mycelial Networks:** Mycorrhizal networks are fungal hyphae that connect roots of at least two plants. It has been suggested that

these networks are ecologically relevant because they may facilitate interplant resource transfer and improve regeneration dynamics (Teste, et al., 2009).

Teste, F., et al. (2009) “Access to Mycorrhizal Networks and Roots of Trees: Importance for Seedling Survival and Resource Transfer.” *Ecology*, vol. 90, no. 10, pp. 2808–2822., <https://doi.org/10.1890/08-1884.1>.

**Mycorrhizae:** Symbiotic association between certain fungi and absorbing roots of plants (Lily, 2010)

Lilly, S. 2010. Arborists’ Certification Study guide. International Society of Arboriculture.

**Mulch:** material such as decaying leaves, bark or compost that can improve soil structure and infiltration, reduce soil moisture evaporation, moderate soil temperature, limit weak competition and reduce soil compaction and erosion (Lily, 2010).

**Patch:** Patches are discrete areas of similar habitat within a larger landscape. A patch of forest might be embedded within a larger landscape consisting of other patches of forest, patches of aquatic habitat (ponds, lakes, rivers), patches of grassland, and more. The shape and size of patches, their location relative to other similar or different patches, and the connections between similar patches together make up the patch-matrix mosaic (Paradise, 2016).

Paradise, C., (2016). *Ecological Concept: The Patch-Matrix Mosaic*. Renewable Natural Resources: Science and Policy Seminar, Davidson College. <https://naturalresources.anthro-seminars.net/concepts/ecological-concept-the-patch-matrix-mosaic/>.

**Photosynthesis:** a process in green plants (and in algae and some bacteria) by which light energy is used to form glucose (chemical energy) from water and carbon dioxide (Lily, 2010).

**Pioneer Species:** Species that are the first to colonize a new site or a new ecosystem. They are shade intolerant and need a lot of sunlight to grow. Poplars and birches are examples of pioneer species (Natural Resources Canada, 2020).

Natural Resources Canada (2020). Forestry Glossary,  
<https://cfs.nrcan.gc.ca/terms>.

**Reforestation:** is the process of replanting trees in areas that have been affected by natural disturbances like wildfires, drought, and insect and disease infestations — and human caused disturbances like logging, mining, agricultural clearing, and development. This can mean anything from supporting natural regeneration in an area that has been degraded to planting ecologically appropriate tree seedlings after forest fires (OneTreePlanted, n.d.)

OneTreePlanted. (n.d.). *Reforestation*. Retrieved from One Tree Planted:  
<https://onetreepanted.org/pages/reforestation>

**Serotinous Cones:** Cones which are covered with a resin that must be melted by heat/fire for the cone to open and release seeds

**Soil Amendment:** Any material added to soil to improve its physical structure and biochemical function (Hillel, 2005).

Hillel, D. (2005). *Encyclopedia of Soils in the environment*. Elsevier Academic Press.

**Sod Mats:** A cut section of grass with a part of the soil beneath the vegetation held together by the grass's roots.



  
mini  
forests

 Network  
of Nature