MINI FORESTS AT SCHOOLS TOOLKIT

A guide for planting and caring for a mini forest at your school

Created June 2025

Contact us: contact@greenventure.ca

Land Acknowledgment

The Mini Forests in Schools toolkit is being written from what is today called Hamilton. Hamilton, Ontario is situated on the ancestral lands of the Haudenosaunee, Anishinaabeg, Huron-Wendat Peoples, and is home to many different Indigenous Peoples – including Métis and Inuit – from across Turtle Island.

Hamilton is covered colonially by Treaty 3, the Between the Great Lakes Purchase of 1792; and traditionally by the Dish with One Spoon Wampum Belt Covenant. Made long before European colonization, The Dish with One Spoon Wampum was a peace and reciprocity agreement between the Haudenosaunee Confederacy and the Anishinaabek. In the belt, the land is represented as a dish to be shared and cared for with people only taking what they need, while stewarding the land to ensure longevity for future generations, peoples, and animals. The single spoon is a non-threatening utensil, representing peace in sharing. Today, the Dish with One Spoon can guide the relationship between Indigenous and non-Indigenous peoples, reminding us of our responsibility to share resources and do so in peace.

The Two Row Wampum Covenant also guides relations on this land. The Two Row Wampum agreement, originally made between the Haudenosaunee and Dutch settlers, is represented by two parallel rows of purple wampum shells running alongside each other separated by three white rows. The purple rows represent the Haudenosaunee, in canoes, and the Dutch, in sailing ships, travelling down the river of life together: each in their own way, not attempting to steer one another's vessel. The three rows of white beads symbolize friendship, peace and respect as the basis for the relationship and agreement that lasts forever. Today, the Two Row Wampum calls on all settlers to honour and respect the ways of Indigenous livelihood, sovereignty and knowledge. This wampum calls on settlers to think of Indigenous Peoples and communities in the actions we take socially, environmentally, and politically.

Treaties and wampums should guide our work as settlers in environmental conservation. The act of planting trees and taking care of them can be a way to uphold the Dish with One Spoon and Two Row Wampun Covenants, while offering a way for us to connect with the land and remember that we are a part of the land. Our hope is that this toolkit can be used in a way that honours these agreements.

Thank you!

The development of this toolkit would not have been possible without our school partners, Dundas Valley Montessori School, Dundana Elementary School, and Parkdale Elementary School. Along with the generous funds provided by the Greenbelt Foundation, the Hamilton Community Foundation's Community Health Education and Research Grant, and Dougher Community Fund with support from the Conserver Society of Hamilton and District.

Disclaimer: This toolkit is intended to be used as a general guide but cannot take the place of professional advice for your specific school. If you are located in Hamilton and want a mini forest at your school please contact Green Venture at trees@greenventure.ca. If you are located outside of Hamilton and have general questions about the guide you are also welcome to contact us.

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Mini Forests in Schools Shared Resources Drive (Click here to access)

- Native Species Plant Lists
- Tree Identification Booklet
- Tree Monitoring Data Sheets
- Mini Forest Lesson Plans

Introduction

What is a mini forest?

A mini forest, based on the Miyawaki method, is a dense and biodiverse planting of native trees that can be established in a small area, enhancing local biodiversity, improving air quality, and providing hands-on educational opportunities. Miyawaki Forests consist of 4-layers: canopy, sub-canopy, small understory trees, and shrubs. This is a new tree planting technique for Canada, but it has been successful in Japan and other parts of the world for over 40 years.

About the toolkit

This toolkit is designed to empower teachers, volunteer parents, school administrators, and community organizations to plant and take care of mini forests at their schools. The toolkit will guide you through planning, funding, building, maintaining and monitoring a mini forest, while offering curriculum-linked lesson plans. The resource was developed from Green Venture's experience of planting mini forests at schools in Hamilton, Ontario, with feedback from school staff, administrators and students.

Who is Green Venture?

Green Venture is a community-based, non-profit organization that inspires and equips Hamilton residents to take individual and collective action to preserve our natural environment, reduce greenhouse gas emissions, and build a community resilient to climate change. Green Venture has been planting mini forests since 2021. Mini forests in Hamilton can be found at: Morton Park (Dundas), Windermere East Park (Windermere Basin), Lake Avenue Park (Stoney Creek), Mohawk College, Dundana School, and Dundas Valley Montessori School.

Why do we need mini forests at schools?

Children need trees now and will continue to as the impacts of climate change increase. Charlie Nelson, an Elder of Bigaawinashkoziibiing, the Roseau River Anishinaabe First Nation, explains how the connection between trees and Anishinaabe people begins at birth: "The tree loves the children. From the tree we make the cradle board". Schools are a central facet of a child's life and our communities. While some schools are fortunate to have green spaces and trees, others are dominated by pavement, which can create heat islands and increase flooding risks. Given that schools make up some of the largest amount of public land in urban areas – land that could benefit current and future generations – why aren't we planting more trees at schools?

The mini forest planting approach offers several unique advantages over conventional single tree plantings that make them especially suited to school settings:

- Small trees in mini forests are less expensive, and easier to transport and plant than larger trees
- Small trees require less water. Amending the soil with compost and mulch in mini forests also reduces the need for watering, whereas large trees require careful and weekly watering until they are established (often up to 3 years).
- Trees in mini forests grow quickly due to competition and soil enrichment, resulting in taller trees over a shorter time period. Mini forest monitoring results in Hamilton demonstrate an average tree height increase of 200 cm (roughly 6.6ft) over 26 months.
- Dense mini forest plantings in a small well-mulched area, also reduce the need for lawn mowing between and around trees, reducing the likelihood of trees being damaged by weed trimmers and lawn mowing equipment.
- Planting a wide variety of native species, with a multilayered design results in more diversity of species and more resilience and ecological stability.

Mini Forests can have extraordinary benefits for students. Environmental benefits include:

- **Removing carbon dioxide from the air**
- **Improving soil quality**
- **Providing cooling areas and shade**
- **Providing food for pollinators**
- **Improving biodiversity**

Tree Canada explains how trees giving students access to a healthy outdoor environment on a daily basis can have a number of social benefits like:

- **Improving mental health and sense of well-being**
- **Improving development**
- **Improving focus and happiness**
- **Facilitating a sense of community**

Mini forests can also facilitate outdoor learning, offering a space and tactile materials (leaves, stem, buds, mulch, soil) for students to explore, imagine, engage, and create with. You will see opportunities to use your mini forest as an educational tool throughout this toolkit.

1. Planning Your Mini Forest

Curriculum Connections

There are many ways a mini forest at your school can be used for learning and educational purposes. At the beginning stages of planning, it may be helpful for your school to understand how mini forests can tie into the curriculum. The following is a chart of some potential curriculum connections. Refer to the Shared Resources Drive for more in-depth lesson plans.

Grade(s)	Curriculum Area	Lesson Topic
Kindergarten	Math	Numbers: Count and tag the number of trees in the forest
1-3	The Arts	Dance: Represent natural phenomena (ie. growth of a tree) through dance movements. Learn about how some Indigenous Peoples use dance to represent nature (ie. Grass Dances).
3-5	Science & Technology	Habitats and Communities: Use the mini forest as an example of a habitat and explore the organisms that live within it and their relationship to one another.
5-8	Science & Technology	Conservation of Energy and Resources: Use the mini forest as a site to explore different types of energy and energy transitions.
9	Math	Geometry and measurements: Calculate the area of the mini forest.
10	Civics & Citizenship	Being an Engaged Citizen: Learn about Healing Forests – how forests shared between Indigenous and non-Indigenous people can be a tangible action that promotes health, healing, and community.
11	Biology	Plants: Understanding the different species within the mini forest, why the mini forest needs different kinds of species, what each species needs to become established and grow.
12	Data Management	Organization of Data: Collecting and organizing various data measurements for each tree in the mini forest.

Desired Outcome

It is important to determine the desired outcome of the mini forest when starting to plan. The desired outcome will help to determine the ideal location for the mini forest to be planted. Mini forests can provide a number of outcomes and often they overlap. What is the desired outcome of your mini forest?

Outcomes may include some or all of the following:

- Shade
- Teaching area
- Play area
- Rest area
- Meditation/mindfulness area

Broader outcomes may include:

- Local biodiversity enhancement
- Climate resiliency
- Community engagement
- Improving air quality
- Increasing access to nature for students

Stakeholder Engagement

Early engagement and consultation with stakeholders is key to a mini forest successful project. Get the word out and gain buy-in from the school board and local community. Who knows, you may connect with someone who is willing to take on a leadership role or who has valuable experience or knowledge to contribute!

Stakeholders may include but are not limited to:

- Parents, teachers, students
- Local Indigenous organizations or communities
- Neighbours living near the school
- School administrators
- School superintendent
- School board leaders & trustee
- Elected government officials
- Local environmental organizations
- Conservation authorities
- Your City's Forestry Department

QUICK TIPS

Stakeholder and community engagement can be ongoing throughout the process and can even take place after your mini forest is planted!

Here are some examples of how you can engage stakeholders:

- Form a Mini Forest Planning Committee with stakeholders
- Organize meetings to align on goals, timelines, and roles
- Spread the word about the mini forest through the school's social channels
- Do outreach at school and community events about mini forests and how one would benefit your school
- Contact the Forestry department in your city to express interest in planting a mini forest
- Contact local Indigenous groups, social and climate justice groups, conservation authorities, environmental non-profits and tree groups in your city about your project
- If you are located in Hamilton, contact Green Venture

Two-eyed seeing and consulting Indigenous communities

Indigenous Peoples' diverse, multifaceted and experience-based understanding of trees and the land as essential to life can help guide our understanding of mini forests in our schools. The concept of "Two-Eyed Seeing" is an Indigenous teaching that encourages the weaving together of Indigenous knowledge and Western perspective to gain deeper understanding. Here is a student-friendly video developed by Science North, explaining "Two-Eyed Seeing" and the weaving of knowledge systems. We recommend building relationships with Indigenous communities near you slowly and reciprocally.

Site Selection

There are a number of variables that will influence where you decide to plant your mini forest and how you will design it. You may have several site options at your school, or just one or two. In any case, evaluating your site conditions will help you decide the best location for your mini forest.

Ecological factors that should be considered:

Soil: The soil quality of your potential sites will influence which site you select for your mini forest. Soil will also dictate which species should be planted in your mini forest. See Soil Testing in Appendix A. for simple, student-friendly ways to assess the soil of your site.

Solar exposure: Does the site receive at least 6 hours of direct sunlight? At least 6 hours is necessary for a mini forest.

Slope: What is the slope of the site? Minimal slope is recommended as it allows for water to infiltrate better. Is the site at the top or the bottom of a slope? This will impact the soil moisture of the site. The bottom of a slope is typically more moist than the top, therefore you would select species that prefer moist soils.

Precipitation and flooding: Are there any drainage or flooding issues on the site or in the area? Areas that tend to pool water may not be the best site for your mini forest.

Local forests and ecology: What types of native trees are already existing near your site? Are there any trees that your mini forest won't like to be near? Search up natural forest habitats near you and see what types of trees and shrubs live there, these species are likely native to your area.

Additional questions to ask:

- Is the site accessible for people using personal mobility devices?
- Is the site a safe distance from busy areas?
- Is the site a safe distance from sports areas like soccer fields or baseball diamonds?
- Where is the site in relation to a hose for watering?
- Where is the site in relation to soil and mulch delivery access?
- Are there overhead utility wires (potential future conflicts with tall trees) above the site?
- Will the mini forest block the sight lines into the school grounds?
- Has the school secured necessary ***locates**** and permissions for the site?
- Does your school have tree planting guides or an outdoor design manual? Have you consulted these resources? (See more in the next section)
- Will the space allow for the trees to grow undisturbed for at least 10 years? Are there other infrastructure projects planned for this site in the future?

*A locate is the process of checking underground for utilities, like water lines, gas lines, and electrical cables, before excavation. See Appendix B. to learn how to request a locate in Ontario.

Site Design

The size and shape of your mini forest are also important to consider. In general, mini forest plantings developed in Hamilton and elsewhere in Canada under the National Mini Forest Pilot covered a minimum area of 100m2. If you're working with a limited space or budget, don't let that discourage you from creating a mini forest. However, strive to select the largest size you can accommodate. The smallest mini forest in Hamilton is 36 trees! Some trees are better than none.

Mini forest shapes can vary depending on the location conditions but several practitioners recommend a minimum width of 4 meters. With a 4 meters wide planting across the full length of the planting without interruptions (such as paths) the planting acts as a more efficient barrier to noise, heat and soil moisture loss and trees are insulated from the impact of herbivory and weed competition. When determining your planting shape, consider desired uses of your mini forest. For example, mini forests can be a backdrop for an outdoor classroom or include paths and seating areas. Also consider that designs with rounded edges and wide curves (curvilinear form) are more aesthetically pleasing than straight edges.

See Appendix C. for Sample Mini Forest Design Plans.

DID YOU KNOW?

Black Walnut releases juglone which can adversely affect the growth of other tree species. If you do have existing trees near your site be sure to identify them and make sure they won't impact your mini forest.

Approval Process

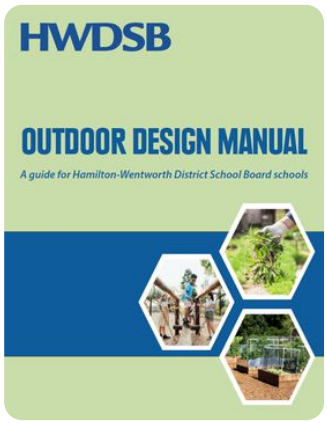
In Hamilton, the Hamilton-Wentworth District School Board's (HWDSB) **Outdoor Design Manual** provides guidelines and requirements for the design, implementation and maintenance of schoolyard features. The Outdoor Design Manual is intended to help schools understand the responsibilities and processes for obtaining approvals and project support from the Facilities Department. For schools in the HWDSB, the Outdoor Design Manual is a necessary document to consult in planning your mini forest.

If you are located outside of Hamilton, be sure to search up the guidelines, policies, procedures and any applications required by the governing body that oversees landscape planning and site alterations at your school. If your school is part of a publicly-funded school board, it is very likely you will need to submit an application or get permission to plant your mini forest.

It is a good idea to begin planning well in advance of the proposed project start date as application review and approvals can take some time. For HWDSB schools in Hamilton, submit your Facilities application as soon as you have the required information ready. Seek out a partner organization with experience developing schoolyard greening projects, like Green Venture, that could support you with this process.

Here is a list of information you should include on your application:

- Mini forest site location and size
- Number of trees
- Supporting documents eg. letters of support
- Benefits of a mini forest at your school
- Approximate timeline
- Approximate budget
- Concept plan or map
- List of tree species



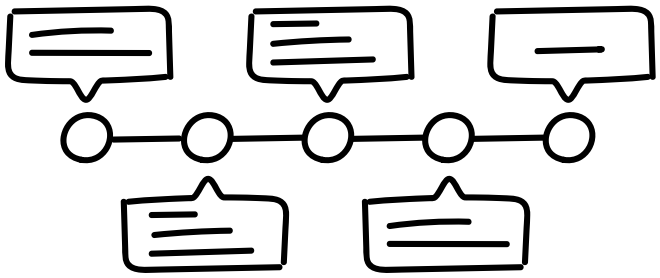
QUICK TIPS

- Mini forests are not a typical ask for many public school boards in Canada, so you may need to explain why a mini forest will be beneficial to your school
- The application process can sometimes be lengthy, make sure to weigh this factor when preparing a timeline for your mini forest
- You can mitigate potential safety concerns about your mini forest in your site selection and designing phase: maintain clear sight lines into the school yard and select a site that will not be a barrier to exits and walkways.
- Safety concerns regarding the installation of the mini forest (site prep and planting) can be mitigated by proper education and instruction about how to safely do these activities.
- Once the mini forest exists, student education is a great way to help students engage with the mini forest safely.
- Ongoing maintenance is another way to mitigate safety concerns.

Developing a Timeline

It is best to work with your school principal, superintendent, planning team and stakeholders to develop a timeline for the project. Here is an example timeline:

- Planning and stakeholder engagement: 2-3 months
- Application and site approval: 2 months
- Finding funding and resources: 3-6 months
- Site preparation: 1-3 months
- Planting: 1-2 weeks



QUICK TIPS

- Planning, stakeholder engagement and finding funding will overlap
- A mini forest may be something you would love to see at your school but you don't have the time or energy to make it happen. We recommend building out your team slowly and connecting with the community to get your team resourced
- Give yourself lots of time to plan and prepare, and secure permissions and locates
- We suggest setting aside 1-2 weeks for the actual planting as some forests may need multiple days to plant or dates may need to be shifted due to weather conditions
- Consider the school calendar and seasons when you plan your project timeline, it is often better to plant trees in the fall instead of the spring as this reduces summer drought stress for newly planted trees
- Remember you need at least 1 month (although 3 is preferred) for the site to rest and prepare the soil (see Section 3. "Building your mini forest" for more info on site preparation)

2. Funding and Resources

Funding and Resources

A typical mini forest can cost between $2,500-$6,000 depending on size, location, in-kind support and other variables. Costs to consider include: soil, mulch, trees, shrubs, protective fencing, tree guards, shovels, work gloves, watering hoses or buckets, signage, monitoring tools and delivery fees. Check with community organizations, conservation authorities or other tree planting groups, to see if they can lend you tools and other equipment. Your planning committee could also request in-kind or cash donations from local businesses. To secure funding, we recommend that your planning team apply for grants to cover project costs or partner with a local non-profit organization to support the grant process. Here are some funding options to help your planning:

Hamilton-based grant opportunities:

- Hamilton Community Foundation: Charitable organization dedicated to improving communities in specific geographical areas. https://www.hamiltoncommunityfoundation.ca/
- Ward-specific community funding: Check your City Councillor's website to see if they have any community funding available
- City of Hamilton Community Grants: Funding and grant programs include the City Enrichment Fund and Placemaking grants. https://www.hamilton.ca/people-programs/community-funding-grant-programs

Other places to look for funding:

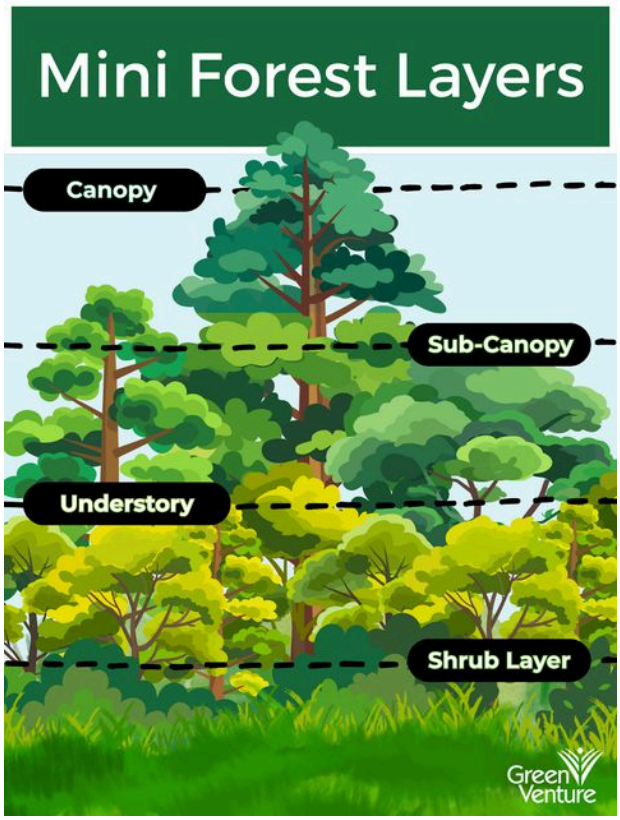
- Tree Canada's Greening Canada's School Grounds Program: https://treecanada.ca/grants-awards/greening-canadas-school-grounds
- EcoSchools Canada: https://ecoschools.ca/eco-funding-opportunities/
- CLIMAtlantic (Atlantic Canada): https://climatlantic.ca/tools/funding-opportunities/community-tree-grants/
- Network for Nature: https://networkofnature.org/Community-Planting-Grants.htm
- Canada Post Community Foundation: https://www.canadapost-postescanada.ca/cpc/en/our-company/community-foundation.page?
- Jane Goodall Institute Canada "Roots & Shoots": https://janegoodall.ca/what-we-do/canada-programs/roots-and-shoots/
- S'Cool Life Fund: https://www.scoollifefund.ca/
- Learning for Sustainable future Action Project Funding: https://lsf-lst.ca/forms/funding-application/

3. Building Your Mini Forest

Species Selection

Select 15-30 tree and shrub species that are native to your region and are appropriate for your site conditions. Understanding your site soil conditions will determine what types of species you want to choose for your site. If you are located in Ontario, the Forest Gene Conservation Association is a great resource for locating your eco-district and the accompanying species. Another excellent resource about building your own mini forest is the Mini Forests free online training course provided by Green Communities Canada and the Network of Nature. Check it out here.

Remember, mini forests include a variety of trees and shrub species selected from each layer of a naturally-occurring climax forest, including the canopy, sub-canopy, understory trees and shrub layer.



Northern White Oak (Canopy)
Image courtesy of Conserving Carolina.

Canadian Serviceberry (Sub-canopy)
Image courtesy of Ontario Flora.

Spicebush (Understory)
Image courtesy of Grow Native!

Red Elderberry (Shrub)
Image courtesy of The Natural Edge.

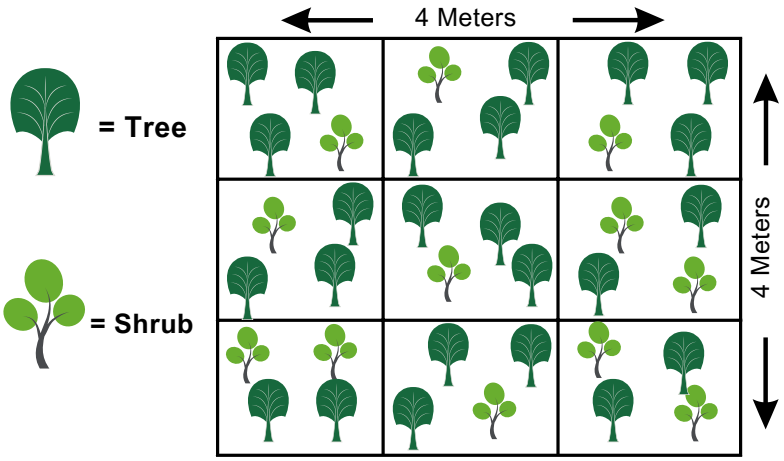
A Southern Ontario mini forest native plant list can be found in the Shared Drive. The lists are divided by the four height classes. We have also provided an additional list of forest herbaceous plant species. If you are located in Southern Ontario you can use these lists to select your species. The Natural Edge Native Plant Database is also an excellent resource for looking up native plants in your region.

When it comes to sourcing plants, we recommend using local native nurseries. The Network of Nature is a great resource for searching for native nurseries near you. Sourcing plants can also be an opportunity to collaborate with non-profit environmental groups, Indigenous-run nurseries and/or organizations, conservation authorities, local landscapers or municipal staff to procure trees from nurseries at wholesale.

Calculating how many trees you need:

A mini forest typically contains 4 trees per square meter, 1 of each height class. The following is a simple formula for calculating how many trees you will need to fill your site.

Site Length (m) x Site Width (m) = Site Area (m2) x 4 = TOTAL # of Trees



Examples:

10m x 10m = 100 m2 x 4 = 400 trees* (*100 canopy, 100 sub-canopy, 100 understory, 100 shrubs).

24m x 6m = 144 m2 x 4 = 576 trees* (*144 canopy, 144 sub-canopy, 144 understory, 144 shrubs).

QUICK TIPS

- You may have to alter your lists based on what is available in your community or if you have access to certain trees, shrubs or plants free of cost.
- The best-sized plants for mini forests are 1-2 gallon pot as they are more cost effective, however you can also plant plugs or bare root trees
- Bare root trees are only available for a short period of time in the early spring or late fall
- Plugs can be planted throughout the season and are less susceptible to pre-planting stress than bare root trees
- Some suppliers are not familiar with mini forests and may tell you that the quantity of trees you are ordering for your space is too high
- Suppliers may offer various heights of trees in 1-2 gallon pots. Selecting the shortest size trees available (eg. 20-40cm vs. 40-60cm) offers better value and trees will quickly grow and catch up after planting
- Confirm your native plant suppliers' first possible spring shipping date or last fall shipping date and plan orders and project planting dates accordingly
- If your planting is taking place over the course of a few days you may need to find a place to securely store trees and keep them watered
- When you are developing your species list be prepared to make substitutions based on plant availability
- If possible, reserve some funding for plant top ups in year 2

Buying Mulch & Soil

Both a soil amendment and mulch will be needed for site preparation. Look for soil amendments with a lower carbon to nitrogen ratio to help supplement soil nitrogen. Products marketed as manure loam, leaf compost or aged manure would work well. Call around to reputable landscape supply stores and read package labels. Soil calculators are available online to calculate the right amount of soil amendment and mulch to order.

The recommended amount of compost and mulch for a 10cm deep layer over an area 10m x10m would be 10m3 (cubic meters).

QUICK TIPS

- Get the soil and mulch dropped as close as possible to the site
- Landscape suppliers often require an amount specified in cubic yards
- Suppliers will often charge an additional delivery fee per truck load
- You do not need to add more mulch to your mini forest when you are ready to plant, you can simply plant in the mulch used for site prep

Green Venture uses aged manure or manure loam. It works well for amending soil. Do not use peat, triple mix, top soil, or potting soil, as these are not appropriate as soil amendments or have negative environmental impacts

We typically use arborist chips, or shredded pine bark mulch, however you can also use mulch alternatives like clean chopped straw or untreated finely chopped cedar mulch.

Site Preparation

Site preparation is the process of amending the soil and reducing non-native weedy plant competition before the mini forest is planted. It is a necessary step to ensure optimal growth and longevity. The following soil preparation method focuses on amending and regenerating the soil by adding organic materials on top of the existing soil to enhance the existing organic material layer and build the soil food web. It is best to prepare your planting location well ahead of time, one to three months beforehand at least, a full season is preferred. An ideal approach is to prepare your planting location in the spring for a fall planting or, conversely, preparing the site in the fall for a spring planting.

What you'll need:

- Soil
- Mulch or mulch alternative
- Shovels
- Gloves
- Buckets
- Wheelbarrows
- Access to a hose
- Cardboard boxes (enough to cover the entire planting area with overlapping edges, all tape and staples removed)
- Volunteers and/or students

The Process:

- Lay down cardboard over top of the plot. Wet cardboard thoroughly with a hose or buckets if possible to speed up the decomposition process.
- Cover the cardboard with a 5-10 cm layer of soil amendment (eg. manure loam).
- Cover the soil with another 10 cm layer of arborist chips or mulch (eg. shredded pine bark).
- Let the mulch and soil rest for a minimum of 1-3 months.

Recruiting Volunteers

Organize a volunteer recruitment campaign to involve teachers, students, parents, staff and/or community members for planting day(s). You may need to split up the planting into a couple days, depending on how many trees and volunteers you have.

Possible options for planting:

- **After school activity:** Community volunteers, parents and students plant trees for 2-3 hours after school hours.
- **Each class plants part of the mini forest:** Commit a day or two of planting where each class can plant part of the forest.

Planting Day!

What you'll need for planting:

- Trees & shrubs
- Shovels
- Gloves
- Buckets
- Tree guards (provide photo)
- Access to a hose
- Wheelbarrows (if possible)
- Watering cans (if possible)
- Water and snacks (optional)

Tree guards: Used to shield young trees from wildlife. They should be put on the bottom of the main stem. They may need to be trimmed to fit the stem and often need to be adjusted as the tree grows. You can find them at your local nursery or hardware store.

Shovel: We recommend a metal round point D-handle shovel for tree planting.

Proper tree handling:

- Carry trees by the bottom of their container or root ball, not by the trunk
- Keep roots moist, do not take the tree out of the pot until the hole is dug and it's ready to be planted
- Keep the tree out of direct sunlight or wind
- Do not stack or pile trees on top of one another
- Do not rip off bottom branches when planting the tree
- Do not step on the pot to get the tree out
- Do not take off leaves or branches

Root ball – refers to the mass of soil and roots.

How to plant your tree:

- Dig a hole 2-3x as wide as the container and as deep as the root ball
- Loosen tree from the pot by massaging or gently shaking
- Once you have removed the tree, massage the roots so that they are not circling the tree and can help the roots to spread out in the soil
- Put the tree in the hole and make sure it is standing upright, adjust it if is leaning and making sure the base of the trunk (the root flare) is level with the top of the hole
- Break up any large clumps of soil and start filling in the hole with the loose soil
- Tamp the soil down with your hands as you fill the hole, there should be no air pockets in the hole
- Once the tree is planted, make sure it is level and not leaning.
- You can now give the tree a healthy watering (at least half of a watering can per tree), re-mulch if necessary, and apply a tree guard!

FYI Coniferous trees (eg. spruce, pine, cedar, tamarack, hemlock) do not need spiral tree guards.

Checking Tree Quality: The "Tug Test" – You want your tree to be tight, not too shallow and not too deep. You can perform a "tug test" to check the quality of your tree planting: gently tug the tree from the top, if the tree does not budge it is tight enough. If the tree comes out of the hole it is too loose, try planting it again but remember to pack the soil in with your hands as you go. Make sure the tree was deep enough to begin with, the top of the root ball should be flush with the ground.

The First Watering – Immediately after you plant your mini forest, give the trees a thorough, deep watering. When you plant a tree, there can be little pockets of air around its rootball. The tree's roots go through a bit of a shock during planting. A good, deep watering helps hydrate the roots and allows the soil to fill in air pockets.

Remember to gather your volunteers and go over safety instructions before planting!

Safety Checklist for Planting Day:

Are the weather conditions safe to plant? If there is thunder and lightning it is not safe to plant.
Is there a first aid kit on site?
Do you have the proper ratio of first aid certified supervisors per participants?
Are the school washrooms open?
Do volunteers know where the washrooms are?
Are their gloves available for participants?
If the day is longer, are there water and snacks available?

Safety Reminders:

- Remind volunteers and students to dress appropriately – rain clothing, hat, sunscreen, close-toed shoes, long pants, etc.
- Ask that participants place their shovels face down on the ground when they are not in use
- If participants are working together to dig a hole, make sure no hands are in the hole while shovels are in use
- Inform participants if there are any noxious weeds on the property
- Allot proper break times especially for participants requiring more time

4. Maintenance and Growth

Maintenance and Growth

Your mini forest project doesn't stop after the forest is planted. Young trees need a bit of help to start developing properly, especially in the first 2 years. Here are some preventative measures you can take to make sure your mini forest has a good success rate:

Temporary Fencing: Depending on the location of your mini forest, adding temporary fencing for the first year or two can provide an additional layer of protection for young trees and keep animals from nibbling. Consider snow fencing or wire mesh fencing held up with T bar posts or rebar.

Temporary Signage: Putting up friendly signage describing what mini forests are and their benefits can help people understand that these are baby trees that need extra care.

Student Stewardship: When students help with tasks like weeding, mulching, and monitoring, it gives them an opportunity to get out of the classroom and feel connected to the mini forest. This in turn, can foster a sense of commitment to the heath and safety of the forest. Maintaining the mini forest is a good opportunity to teach students how to engage with the forest. (Ie. be gentle, don't break limbs, be mindful where you are stepping in, etc.)

Example of informational signage from the Dundas Valley Montessori School mini forest, created by Green Venture.

Watering

Mini forests are designed to be self-sufficient and generally do not need regular watering once established. However, there are a few key times when a little extra water can make a big difference, especially for young trees. We recommend watering your forest during hot or dry spells for the first 2 years.

- **How to check soil dryness:** Stick your finger into the soil near a tree about an inch or two. If it feels dry, it's time to water. If the soil is still moist, wait.
- **How to water:** A slow trickle from a hose for about 15 minutes works well for an area of approximately 4 m2. Move the hose around at 15 minute intervals along a grid to be sure to cover the entire area.
- **Where to water:** Water around the tree, not directly at the base of the trunk, as too much moisture there can cause rot.
- **When to water:** Early morning or evening is best because the water won't evaporate as quickly in the cooler temperatures.
- **After Two Years:** Once your mini forest is about two years old, the trees' roots will be much stronger and deeper. At this point, they typically won't need any watering. They'll be able to find most of the water they need from rainfall. You'd only need to consider giving them extra water during very long and unusual dry spells.

No hose? If you don't have access to a hose, you can water trees using buckets or jugs. Some schools have utilized filled jugs or buckets with lids, transporting them to the mini forest with a wagon. We suggest using two full 5 gallon buckets per square meter.

See the Watering Table in Appendix D. to know if your trees are being overwatered, underwatered, or watered just right.

Weeding

Weeds and invasive species compete with young trees for important things like water, sunlight, and nutrients, therefore it is necessary to remove them in early years, especially if they are taller than the trees or shrubs.

- **How to weed:** Gently pull out weeds by hand or use a small garden tool. Be careful not to hurt the tree's roots but ensure you are removing the entire weed, which often have tap roots or spreading rhizomes.
- **When to weed:** Weed 2-3 times from early spring to fall. Early spring weeding helps to prevent weeds from getting established and weeding before plants set seeds helps to stop their spread.
- **Student Helpers:** Getting students involved in weeding is a fantastic way for them to learn about how plants compete and why it's important to help our mini forest grow.

QUICK TIPS

The most common weeds we see in Hamilton mini forests are teasel, crab grass, clover, thistle and burdock.

6. Monitoring and Ongoing Education

Monitoring and Ongoing Education

Planting your mini forest begins an amazing journey, creating a "living classroom" that grows with your students. Involving students in the care and observation of your mini forest builds a stronger connection to nature, develops real-world science and math skills, and fosters a sense of environmental stewardship. These flexible and engaging monitoring activities, easily integrated into lessons from Kindergarten to Grade 12, require minimal equipment. You'll find ready-to-use lesson plans in the Shared Drive to help you get started. This also offers a wonderful opportunity to involve families, school clubs, community volunteers, or local Indigenous Elders and Knowledge Keepers.

How to Get Started with Monitoring

Setting Up Monitoring Plots

Before you start tracking your trees, you'll need to set up "monitoring plots." These are circular areas where you'll closely watch a sample of trees in the mini forest. By watching the same trees year after year, you can compare your observations and see how your mini forest is really changing and growing over time. For every 100 meters squared of mini forest, you'll need one monitoring plot. We recommend the radius of each plot be 1.8 meters (an area of approximately 5.7m). Your sample plot will likely have approximately 30 trees in it.

What you'll need:

- A measuring tape or a 1.8m string/rope
- A wooden stake or straight stick
- Some small flags or flagging tape

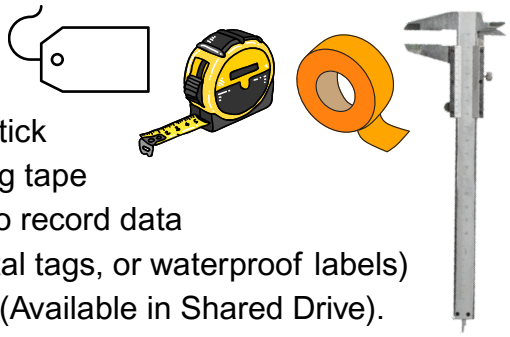
How to set it up:

- Pick a central spot in your mini forest and place your stake firmly into the ground. You can use a hammer or mallet to pound the stake in.
- Tie a piece of string to the central stake, and measure out exactly 1.8 meters. Alternatively, you can pre-set a measuring tape to 1.8 meters, but the string method is typically easier, especially if you are working with younger students.
- Hold the string firm at its end as seen in the photo and walk around to complete a full circle. Every tree your string or measuring tape touches is in your circular monitoring plot.
- Flag each tree in your monitoring plot with flagging tape or anything you can use to remember what trees to include in your plot once you remove your string or measuring tape.

Your First Look: Baseline Monitoring Activity

Once your monitoring plot is set up, your very first time collecting data is called "Baseline Monitoring." This activity can be done with students grades 4 through 12. We recommend collecting this data once a year if possible. Record data for both trees and shrubs.

What you'll need:



- A measuring tape or metre stick
- Calipers or flexible measuring tape
- Pens/pencils or technology to record data
- Tree tags (flagging tape, metal tags, or waterproof labels)
- Tree Monitoring data sheets (Available in Shared Drive).

What is a caliper?
A measuring tool with two legs or jaws that can be adjusted to determine diameter. It is useful for working with narrow objects, like a tree stem!

What to do:

1. Pick a tree close to the centre of your plot.
2. Label the tree tag “P1-T1” (Plot 1, Tree 1). You can write on the flagging tape with a sharpie, use metal tree tags and etch on their label, or use loose zip ties with a water-proof label attached. Record the tree identification number in your data sheets.
3. Identify the type of species of the tree. Refer to a tree guide or check our Tree Identification Booklet which can be found in the Share Drive. Record the species.
4. Next, you’ll need to visually determine the tree’s status (is it alive, dead, damaged, leaning, or missing), as well as the leaf condition (100% of leaves are healthy, 80% of the leaves are healthy, 20% of the leaves are healthy, etc.). Record this data.
5. With your measuring tape or meter stick, measure the height (cm) of the tree from the very bottom of the trunk to the tallest tip of the tree. Record this data.
6. Next, measure the tree’s crown diameter (cm). Locate the 2 branches that stick out the farthest from the tree's trunk and measure the distance between them. Record this data.
7. Using calipers or a flexible measuring tape, measure the diameter of the tree’s main stem at 5 cm above the ground. If you opt to use a flexible measuring tape, take the circumference of the tree’s main stem at its base and convert this measurement to diameter using this formula: Diameter (d) = Circumference (c) ÷ pi (3.14159).
8. Lastly, write down any other notes about the tree if applicable in your tree monitoring sheet.
9. Move onto the next tree and repeat the steps.

Check out the Shared Resources Drive to help you with this baseline monitoring activity!

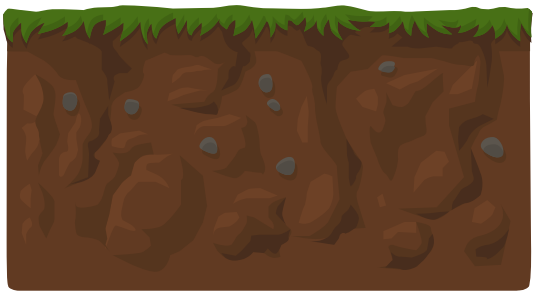
What students have to say:

We asked students monitoring a mini forest at a school in Hamilton to share their feedback and tips:

- Each tree takes more time to assess than expected
- You have to look through the whole tree ID booklet to find your tree
- Tree identification is hard!
- Don’t mix up circumference vs. diameter of the stem
- I loved being in the mini forest
- I loved the feeling of rain on paper
- I liked how you have to use your hands to do things

Other Yearly Monitoring Activities (Optional)

Annual Soil Health Monitoring



What you'll need

- A sheet of paper to record your observations
- Pen/pencil

Record the following information:

Soil Texture: Take a small handful of soil and use a simple guide (like the chart in Appendix B.) to figure out if it's mostly sand, clay, or a mix. Do this in a few spots inside and outside your mini forest.

Soil Color: Hold a small soil sample next to a soil color chart to find the closest match. Soil color can tell you about how much organic matter (like old leaves) is in the soil.

Mulch Depth: Gently move aside a bit of mulch (wood chips) until you see the soil. Use a ruler to measure how deep the mulch layer is.

Soil Compaction (How squished it is): Gently push a wire flag into the soil until it bends. Mark where it bends, pull it out, and measure how deep it went. Why does soil compaction matter? If soil is too compact, it's hard for roots to grow and for water and air to get into the soil. You want nice, loose soil for happy roots! Do this in a few spots inside and outside the mini forest.

Annual Biodiversity Monitoring

What you'll need:

- A sheet to write down your observations
- Tiles (optional–for monitoring ground dwellers)

Record the following information:

Plants: Walk around and look for any new plants that you didn't originally plant. Take pictures of anything unfamiliar and upload them to iNaturalist. If you see "invasive" plants you may need to remove them.

Pollinators, Birds & Mammals: Find a quiet spot and sit still for about 30 minutes. Watch for any wildlife (bees, butterflies, birds, squirrels, etc.) and take photos. You can upload these to iNaturalist to help identify them!

Student Feedback!

- 10 students per tree is too many, better to have 2-4 per tree
- If you can't ID tree by looking at it, sometimes you can crumple leaves to identify a tree (eg. Spicebush)
- Cooperation is needed for monitoring
- Some students were really involved, others were not participating
- Different colour flagging tape would help for identifying which trees have been monitored because it is hard to keep track of where you are at

Ground Dwellers: On your first visit, place 3 flat tiles on the ground in different spots. On future visits, gently lift each tile and take pictures of any bugs underneath. Put the tile back in the same spot, touching the soil.

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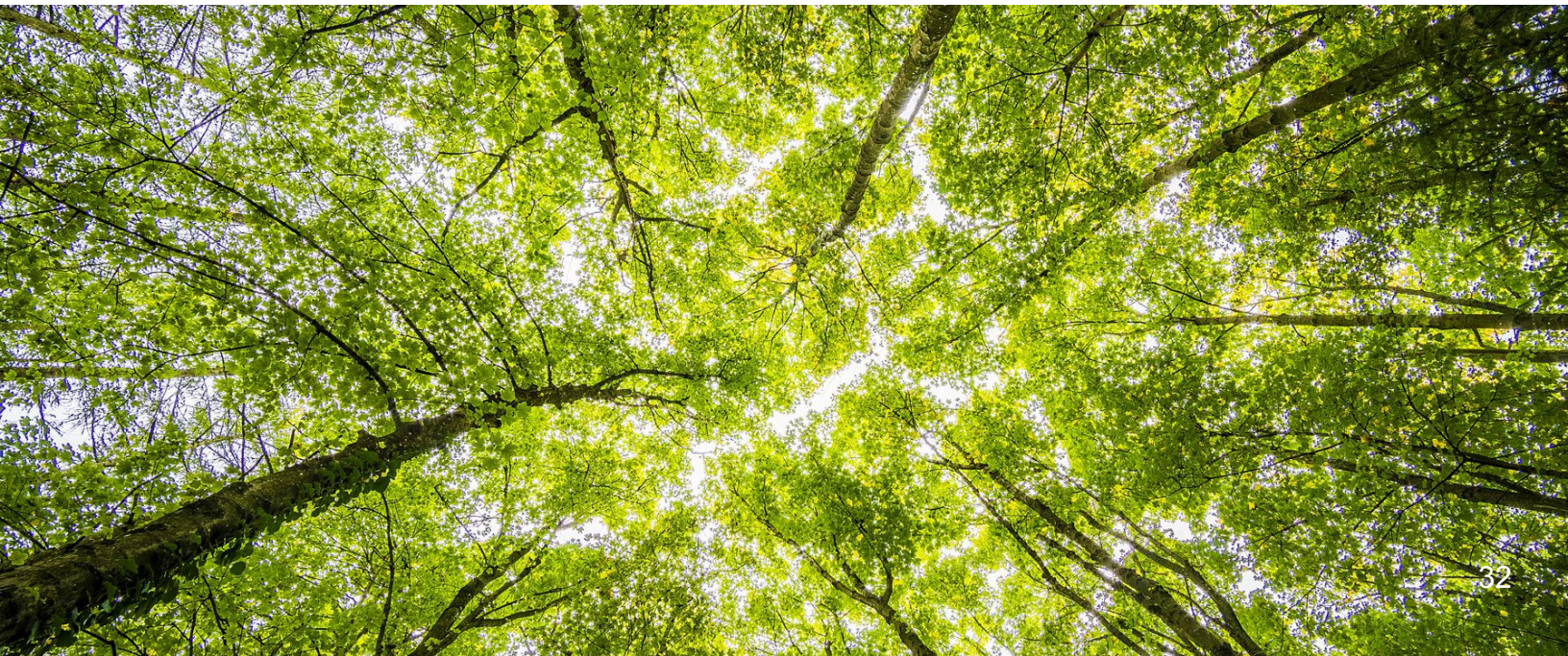


Appendix A: Soil Testing

The Feel test:

Pick up a fist sized sample of soil from your potential mini forest site. Handle the soil and squish it between your fingers. Use the following flowchart to identify which type of soil it is:

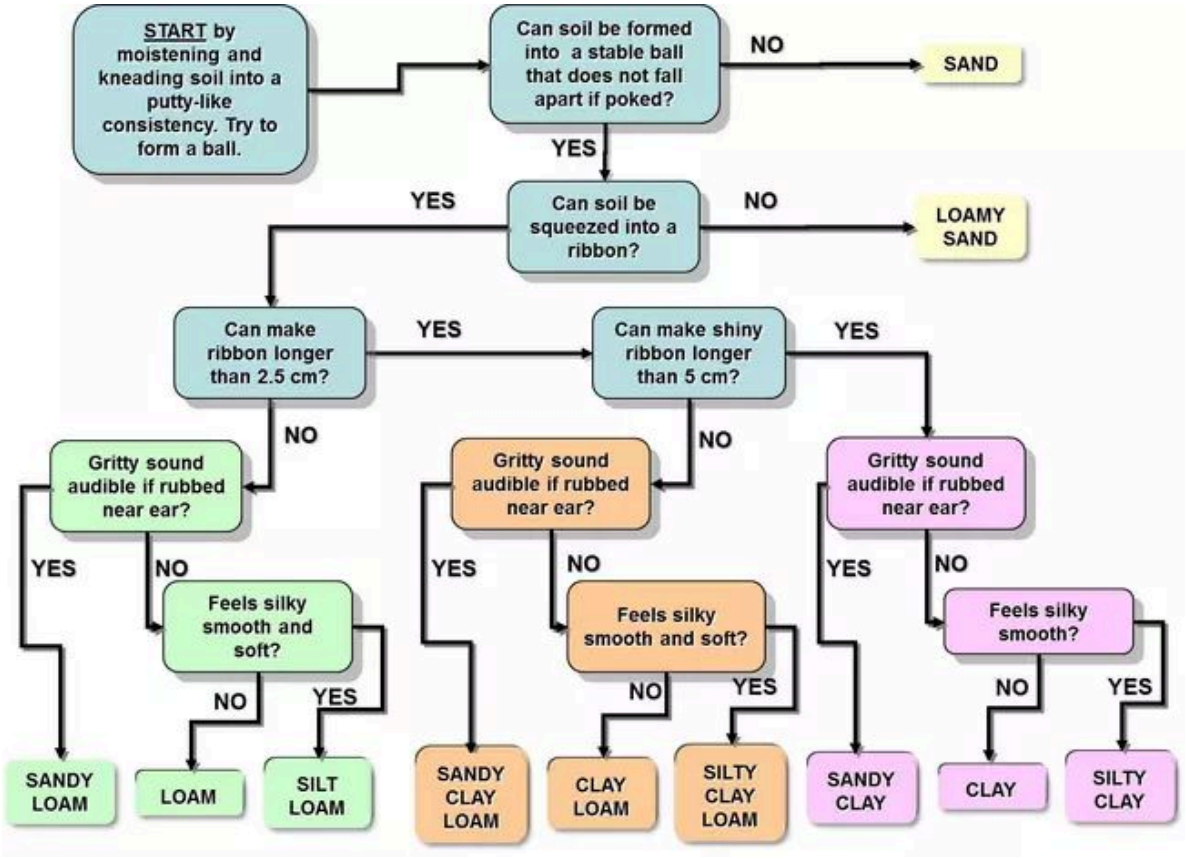


Image source: https://serc.carleton.edu/details/images/250967.html.

The Jar test:

- The jar test takes more time but is more precise. You could also do it as a science experiment with students.
- Collect soil from a few different areas of your mini forest site and lay it out on a flat surface.
- Let it dry until the texture is quite crumbly.
- Pick out any roots, grass, rocks or other chunks of organic matter.
- Scoop 1 cup of soil into a glass mason jar, add a squirt of liquid dish soap, and then add water. Leave about 3 cm of room at the top of the jar to allow for some movement.
- Screw on the lid and shake your jar vigorously for 2-3 minutes.
- Set it somewhere undisturbed and let it settle for a minimum of 24 hours, up to 48 if you think you have high clay content.
- As the soil settles, it will layer itself. The bottom layer will be sand and gravel. The next layer will be finer sand, the third layer will be silt, and the top layer will be clay. Once it has all settled, you can measure how thick each layer is and figure out what percentage of each element you have.

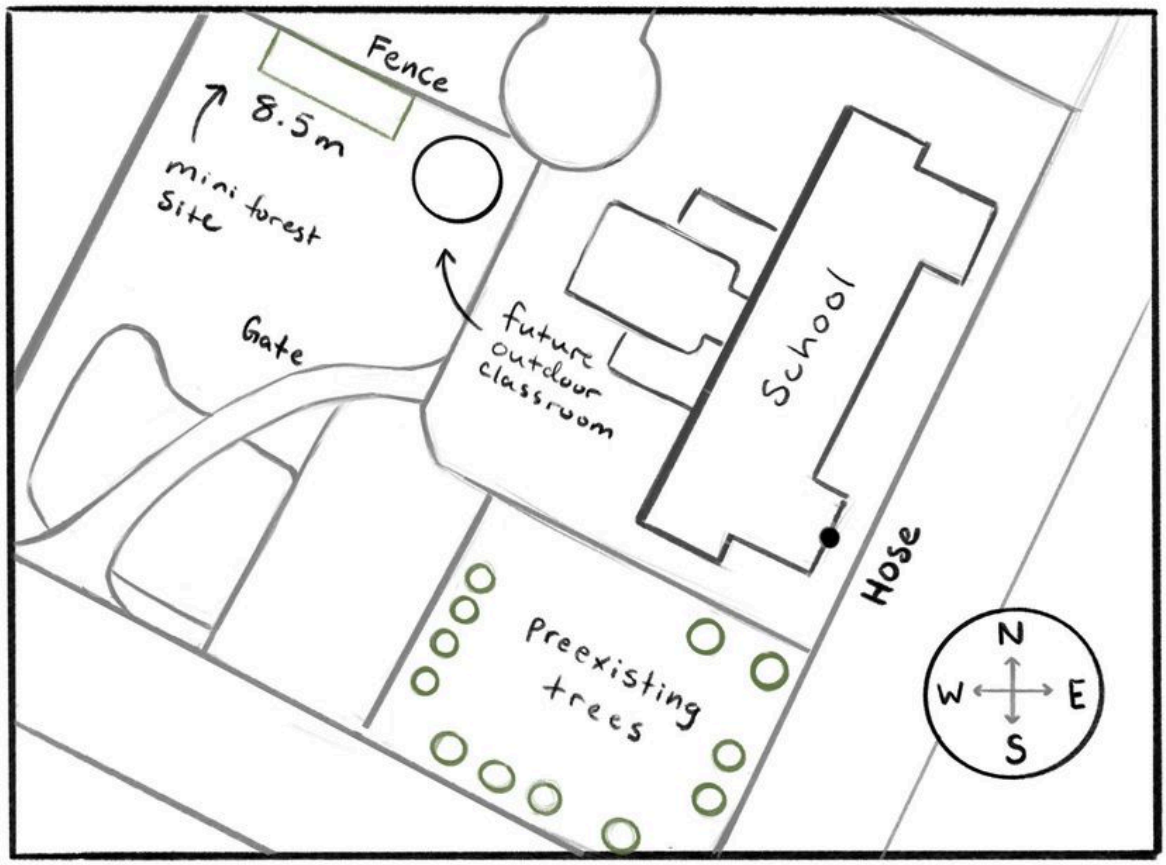
Appendix B: How to Request a Locate in Ontario

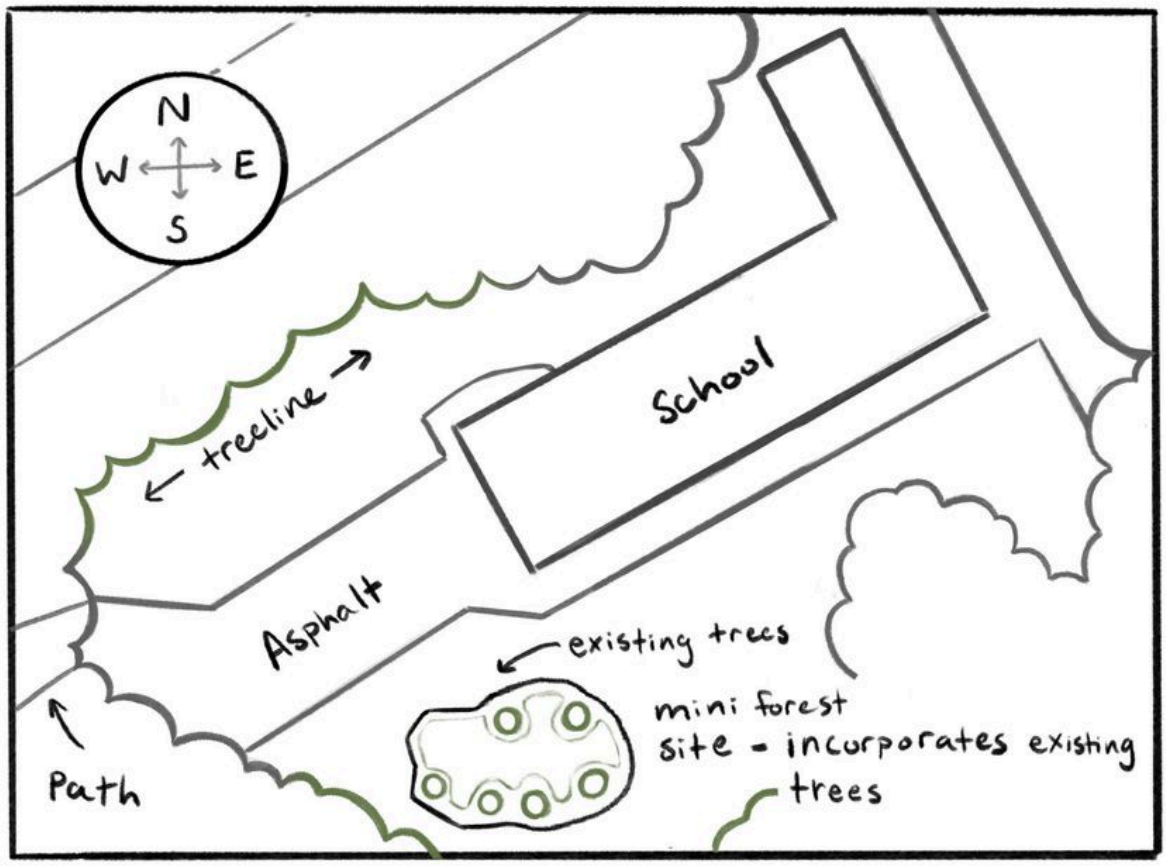
- Go to the Ontario OneCall website and click ‘Request a Locate’
- Click ‘Contractor’ and create a new account
- As a contractor, they will automatically assign you a contractor ID
- Click ‘Create a Locate Request’ and select ‘Single Address Request’
- Add contact and dig location information
- Draw the dig location on a digital map and fill in your info
- They suggest adding additional information like site pictures, concept plans, drawings, etc.
- Next, fill in the information. Always select ‘Hand Dig’ and ‘Up to 4 feet’ for tree planting unless otherwise
- Add any additional information you would like Ontario OneCall to know about your request, and then hit the next step and submit

Tips:

- We recommend using the How To videos, especially for mapping your dig location
- If you made a mistake and realize after you submitted, there is a way to go back and edit
- If you don’t have a planting date confirmed, put the earliest possible planting date just in case
- Locates are valid for at least 60 days so as long as you plant the mini forest 60 days after receiving the locate you’re in the clear
- Check the locate sheet sent you for the exact length and conditions of the locate request
- We recommend checking out the Contractors Resources and FAQ section on the One Call website

Appendix C: Sample Mini Forest Design Plans





Appendix D. Watering Table

Condition	Signs in Your Trees	Signs in Your Soil	What to Do
Overwatering	Leaves yellowing or wilting despite moist soil	Soil feels constantly soggy or waterlogged	Water less often
	Fungal growth at base of tree	Standing water after rainfall or watering	Improve drainage (e.g., add compost or aerate soil)
	Soft, mushy roots if checked		Avoid watering if rain is forecast
Proper Watering	Leaves appear healthy and firm	No pooling after watering	Maintain consistent schedule
	New growth is visible	Soil is moist 2 to 4 inches below surface (not soggy)	Adjust for rainfall and hot weather
	Tree stands upright without wilting		
Underwatering	Leaves are dry, curling, or browning at the edges	Soil feels dry several inches down	Increase watering frequency
	Tree may wilt or look droopy		Deep water to reach root zone
	Stunted growth	Hard or cracked soil on the surface	Apply more mulch to help roots retain moisture