



Agroforestry Planting Considerations

Photo Credit: Ben Russell

Agroforestry fact sheet #1

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Why Agroforestry?

Trees can be planted on-farm for a variety of reasons, such as providing shelter, protecting water quality, improving biodiversity and increasing income streams. As each agroforestry project encompasses one or more of these goals, no two projects are alike and so require an individualistic approach. There are, however, some general rules of thumb to follow to encourage proper establishment when planting trees on your farm.

Site Selection and Assessment

When considering a site for a potential agroforestry project, it's important to be aware of surrounding environments, including the history of usage of the area. It can take decades for trees to mature, and oversights in the planning process can be costly and frustrating. Consider how the project will affect the farm, and any associated potential risks. Surrounding infrastructure (such as powerlines, buried pipe/wire, outbuildings) could be damaged by roots and branches. How frequently does the area need to be accessed, and by what equipment? Be realistic about the time needed to manage the site, especially in the critical first few years of establishment.

Drainage and shade are two major factors that affect establishment and should be considered when choosing a site. Provincial soil survey maps can help identify soil types and drainage limitations in the landscape, however, small areas (or microsites) can vary throughout a landscape, so surveying the planned project area can help identify sections of land to avoid. If there are natural forested areas near your planned project, determining what species are present and healthy can point to what species of trees are best suited to the environment. By electing species that are conducive to the landscape and employing best practices for establishment, the likelihood of a healthy and productive agroforestry project increases.

Species Selection

Once project goals and planned planting areas have been finalized, they should help inform which species of trees and shrubs are best suited. The ideal species will vary depending on the landscape, as well as the requirements of the project. Is a quick growing biomass (like poplar/willow), or longer maturing, more valuable timber (oaks, maples) more favorable to your operation? Can both be implemented in tandem? Are there opportunities for other harvestable produce (fruit, berries, tree nuts) that can be integrated into the stand?

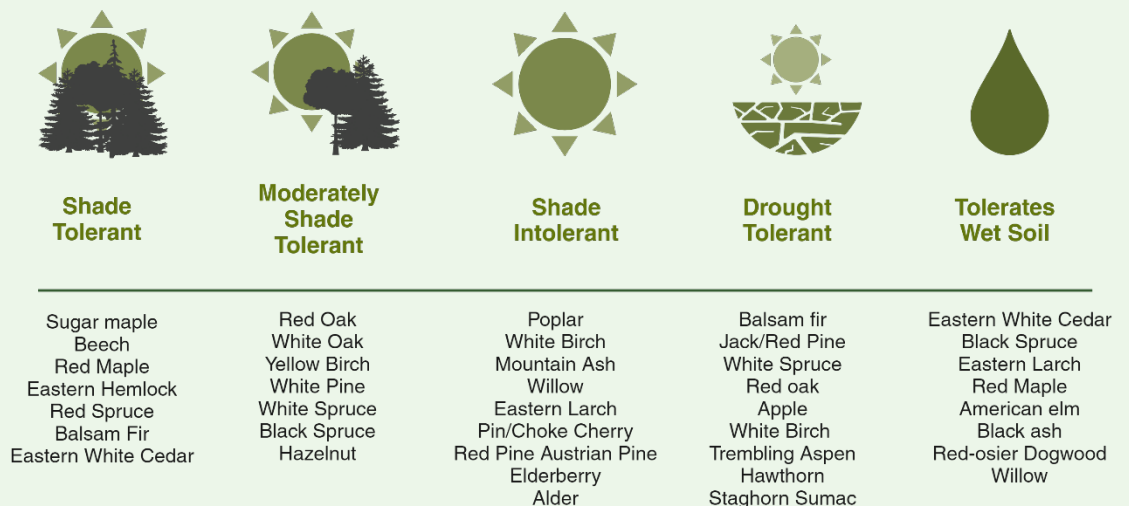


Figure 1. A selection of native tree and shrub species and their preferred environmental conditions.

Intermittent shrubs especially thorny species (such as Hawthorn, or Wild Rose) which can dissuade browsing, helping to create natural barriers. More diverse systems will be more resilient to disease and extreme weather; however, each species may require specific pruning and maintenance schedules. There is no shortage of options when selecting species, and no single design to serve all purposes. Some species can tolerate a wide range of conditions while others may be best suited for a more specific environment. Fig. 1 highlights some common native species and their preferred sunlight and soil moisture conditions. These lists are non-exhaustive and provide some indication of appropriate species, however many other constraints, such as spacing, logistics, and microclimate must also be considered when making species selections.

Trees and shrubs native to PEI and Acadian forests are adapted to the local environment, playing important roles in providing habitat and fostering natural forest succession. Using native species whenever possible helps ensure ecosystem resiliency as non-native and exotic species can overtake ecological niches of native species, sometimes very successfully. The PEI Invasive Species Council (peiinvasives.com) provides detailed lists and information on various species of concern, which are recommended to avoid. There is a large diversity of native trees and shrubs to choose from, however nursery supply may limit the selection, with rarer or more difficult to propagate species potentially taking more time to access than others.

Regardless of species, it's best to place your order well in advance to ensure available stock (minimum 1 year). For more information on local nurseries and species selection, visit <https://www.princeedwardisland.ca/en/topic/tree-planting>

Site Preparation

Site preparation should be undertaken in the year prior to receiving your trees, preferably in late fall/winter to discourage competing plants from colonizing the area after preparation. Agroforestry conversion projects generally require some intervention to create healthy environments for seedling establishment, as opposed to tree planting efforts in established forest ecosystems. Soil should be well drained, fertile, and free of competition, which can require various soil preparation techniques and adequate cover (through mulching or plastic row cover). The figure below highlights some site preparation techniques that can help improve establishment in various conditions.

Soil nutrient and soil health testing can also be helpful tools when assessing and preparing land for establishment. These tests can identify any nutrient imbalances, as well as the relative biological activity and structural integrity of the soil. Generally, a fertilization regime is not required when establishing agro-forestry projects (barring orchards), however soils with low organic matter may benefit from additional organic amendments or topsoil additions at the time of establishment. Incorporating inorganic fertilization at planting is not recommended unless it is of a slow-release variety, as young trees containing high levels of nitrogen may attract unwanted pest pressure.

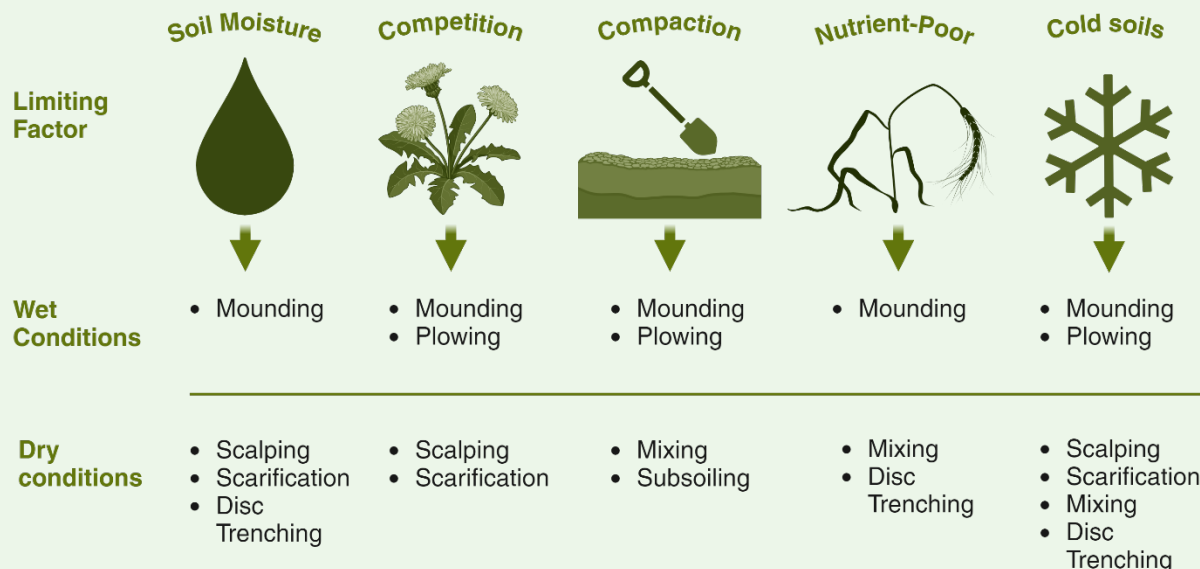


Fig. 2 Soil Preparation techniques for successful agroforestry establishment (Adapted from Natural Resources Canada)

Sapling Care

As seed viability varies considerably across species and environments, most purchased trees are received as saplings, either in containers or through bare root stock. Planting requirements vary for each type, so ensure you know what form the saplings will be in when purchasing. Below are some general guidelines for planting both bare root and container saplings.

Bare root stock

When correctly planted, bare root trees have the highest rate of success, however timing is critical when establishing bare root stock trees and shrubs. These saplings need to be planted in spring, and cannot go dry at any point before planting, so preparing for the site and saplings beforehand is strongly recommended. Once received, inspect the trees and trim any roots that are broken or circling the trunk. Tree roots should be soaked in water or a water-soil slurry for several hours to regain moisture lost in transit, as well as before planting. Even 5 minutes of exposure on a hot, windy day can be enough to kill roots on bare root stock, so immediate planting is always preferred. Bare root saplings can be stored in cool, covered conditions for a few days, ensuring roots do not dry out. If, for any reason bare root stock cannot be directly planted within the week of receiving, they can be “heeled in”, by laying the bundled seedlings in a shallow trench and covering the tree roots in loose, moistened soil (fig.3). If received with intact leaves, bare root stock may also benefit from a 30% pruning of each lateral branch to reduce moisture loss.

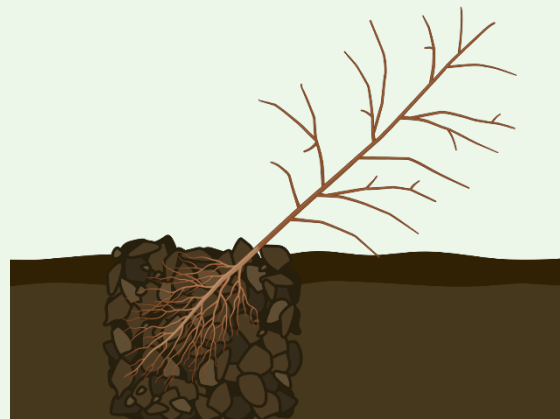


Fig.3. Example of heeling in bare root stock saplings

Covered root stock (container, burlap bundle)

Covered saplings are less sensitive than bare root stock and can be planted throughout the growing season but should still be kept moist and planted in a timely fashion after receiving. Water containers well the day before planting, if possible, near the establishment site to reduce transportation weight and labour on planting day. When planting, inspect and loosen the root ball, pruning any roots that encircle the root mass to encourage new growth. Unlike bare rooted saplings, container stock rarely needs pruning in the first year unless there are damaged or crossed branches.

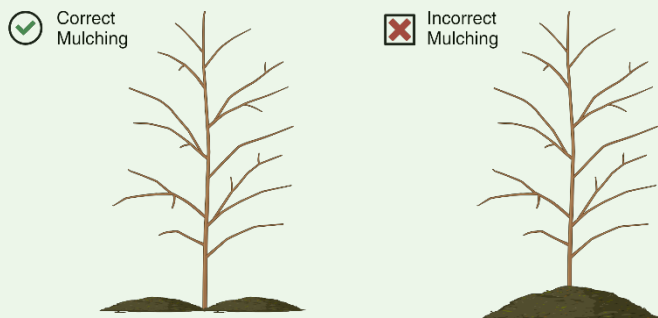


Fig 4. Mulching can help hold water and reduce competition but can also encourage rodent damage if improperly spread.

to encourage root penetration. Place the root mass on the topsoil, with the sapling's collar (or flare) at or slightly above the ground. Once placed, fill the remaining area and tamp the ground, ensuring the tree is properly stood. Mulch the surrounding area with 10-15 cm of wood chips or other mulching material, spread from beside the stem to past the tree's dripline. Mulch should be kept away from the tree stem, creating a “donut” shape (fig.4), which helps retain water and prevents rodent activity.

Seeds, Transplants, and cuttings

Some native species can be propagated from neighboring natural areas through various means, including seed collection and cutting propagation. Although not feasible for large scale agroforestry projects, establishing species which are not available through local nurseries can help foster native biodiversity on your farm. These methods are labour intensive and vary considerably in their success, however many rare native species can provide distinct habitat for native wildlife. More information on viable species for propagation, native nursery as well as how to contribute to ecologically sound forestry is available through the MacPhail Ecological Woodlot Association.

Whether covered or bare root stock, ensure the young trees have received plenty of water the day before planting. When digging holes for saplings, aim for at least 2-3 times the size of the root mass or container (Using a tarp can help with backfilling). Holes should be backfilled with loose topsoil (or a topsoil-compost mix), roughing up the sides of the hole

Ongoing Maintenance

Water

Newly planted saplings require care and consideration, especially in the first year. A steady supply of water is crucial, with daily waterings recommended in the first few weeks, leading up to weekly until roots have been established. Root establishment and irrigation volume vary with caliper size, or the width of the sapling stem 15cm from the ground (table 1). Larger saplings take much longer to fully establish and may benefit from irrigation for several years. Slower, more consistent watering is ideal for establishment, but may not be possible in all situations. If available, automated scheduled irrigation can be helpful in maintaining adequate water during the growing season.

Table 1. Watering requirements for establishing saplings (adapted from UMN extension)

Caliper of tree trunk	Root establishment time	Liters of water at each irrigation
2.5cm	1.5 years	3.5-5L
5cm	3 years	7.5-12.5 L
7.5cm	4.5 years	12.5-17 L
10cm	6 years	15-22.5 L
12.5cm	7.5 years	20-30 L
15cm	9 years	22.5-35 L

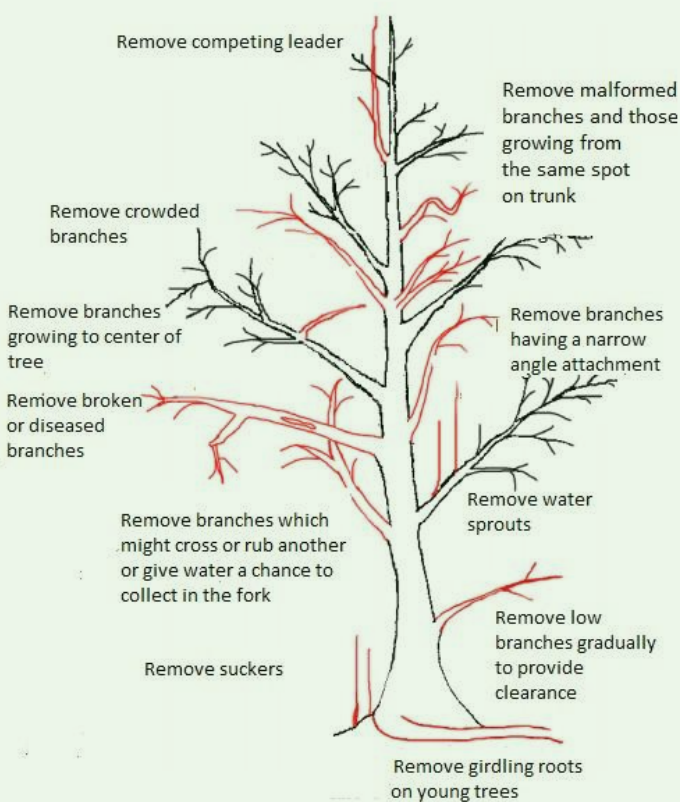


Fig. 5 Candidate branches for pruning (Maryland extension)

Pruning

Young trees can be pruned as they mature to prevent disease and develop a desired shape. This is especially helpful when traffic (equipment, livestock, or personnel) is present, or when attempting to foster high value timber/fruit yields. Pruning is generally best conducted in the early spring, before budding occurs. Suckers, low or damaged branches, and waterspouts are all candidates for pruning. Remove no more than 30% per pruning and aim for 45-degree cuts to minimize infection. Over time, trees and shrubs may grow too dense for proper light penetration and can be selectively pruned for ideal light and air circulation.

Pest control

Rodents, such as mice, voles, and rabbits are attracted to young saplings, and can cause significant damage and/or kill trees by browsing and girdling bark. Ensure grass is mowed and brush is kept to a minimum near the planting site to reduce habitat potential. Physical barriers are the most effective tool for pest control, using individual tree wrap and/or fencing around the sapling(s) to prevent damage. Hardware cloth (around individuals or the planting site), buried in the ground and extending above the anticipated snowline is an ideal method for browsing prevention. If fencing is not feasible, there are also various repellents that can be applied directly to the tree to discourage browsing. These may contain active biocidal ingredients such as Thiram and should be used only as directed. Direct killing of rodents (through trapping or rodenticides) is not recommended as populations can rebound very quickly, potentially at a higher reproduction rate than before.

Competition

Continued removal of potential competition over the first few years of establishment ensures the saplings have ample room to outgrow surrounding

plants. Top up mulch as needed, and mow the surrounding area to prevent perennial competition. Other options to reduce competition could include seeding the area with a cover crop (such as white clover or perennial rye), or chemical controls in the form of herbicides (as a last resort). Frequent inspection of the project area can help ensure competition is controlled and issues are dealt with in a timely manner.

Revitalization

As many farms on PEI have historically planted spruce hedgerows, there are many older stands which may now be dying off or have partially fallen from strong winds. Although unsightly, deadfall and other debris can act as important habitat for a range of species and can create conditions for other native trees and shrubs to establish so removal is not recommended. These “volunteer” species can also help indicate which native species are well suited to the area and could thrive in the new stand. When revitalizing old hedgerows, it’s best practice to establish new plants approx. 5m from the original, preferably on the south facing, sunnier side. All considerations listed above apply to revitalization planting.

Multiple provincial funding streams can help support the purchase and implementation of agroforestry projects. To learn more about various on-farm uses for trees and the provincial support provided, see the remaining agroforestry series fact sheets or contact the PEI Department of Agriculture at DeptAg@gov.pe.ca or 1-866-PEI FARM

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Figures created in BioRender.com unless otherwise specified.