



Technical Note

Planting Trees on Upland Forested Sites

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Introduction:

The Alberta 2010 Reclamation Criteria for Wellsites and Associated Facilities in Forested Lands requires that wellsites reclaimed on or after June 1, 2007 meet the following criteria:

"(i) If a Natural Recovery Site: A minimum of 25% canopy cover of herbaceous species; and a minimum of 25% canopy cover of woody species or a minimum stem/plant count of 5 stems per assessment point area (1.78m radius assessment area; 10 m²).

"(ii) If a Planted Site: A minimum of 25% canopy cover of herbaceous species; and a minimum of 25% canopy cover of woody species or a minimum stem/plant count of 2 stems per assessment point area (1.78m radius assessment area; 10 m²)."

An effective, reliable and relatively inexpensive means to achieve these requirements is to plant seedlings and/or deciduous cuttings. This document provides a brief description of the planting process and identifies resources that may simplify obtaining planting stock, finding a tree planting contractor, and other logistic details of planting.

Anyone undertaking work of this nature is advised to develop a good working relationship with forest product companies in the region. The technical and logistical difficulties in obtaining tree seed and arranging for growing, shipping and planting of seedlings is high. To fully understand the process requires specialized knowledge, experience and specific resources.

Silviculturists working for the forest products companies are specialists in growing and planting tree seedlings and are generally willing to cooperate with other industries in restoration of forests. Specifically silviculturists may be able to assist by:

- Conifer seed may be available for purchase through their ongoing seed collection programs.

- Often these companies have excess seedlings that they are willing to sell, or they may be willing to include additional seedlings in their nursery orders to be used for wellsite reclamation.
- They also have access to tree planting contractors that work throughout the company's area of operations. It may be possible to arrange for these contractors to provide a small crew of people for a wellsite planting program.
- Silviculturists will be able to offer guidance on determining planting density - as the 2010 Reclamation Criteria requires that at the time of the vegetation assessment there are 2000 woody plant seedlings per hectare; and on planted sites a minimum of 2 growing seasons are required prior to conducting the Vegetation Assessment for the submission of a reclamation certificate application.

Planting coniferous seedlings



Figure 1. Freshly planted lodgepole pine seedling

Acquiring tree seed

Obtaining conifer seedlings for planting begins with the acquisition of tree seed. This is done through the collection of cones from mature trees. Cones from lodgepole pine are collected when the trees are harvested. White spruce only produces good seed crops periodically. When there is a good seed crop cones are collected using helicopters with specialized harvesting equipment. Following collection, cones are shipped to the Alberta Tree Improvement and Seed Centre for seed extraction, germination testing and storage.

The '*Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS)*' regulates the collection of tree seed and the growing and planting of tree seedlings. Under these standards the province has been subdivided into seed zones. Seedlings to be planted within a particular seed zone must be grown with seed collected from that zone. Permission is required to collect seed before it is actually done. Collection of seed is carefully controlled, with AESRD approval required for the collection and transportation of seed, for growing seedlings and for the purchase of seedlings from a nursery.

Reclamation specialists need to plan ahead. Getting permission to collect seed, collecting the seed, cleaning the seed and growing the seedlings all takes time. It is recommended to start planning at least a year ahead of when you would like to plant.

Seedling selection

There are many factors to consider when deciding upon the type of seedling to be grown. Variables include:

- tree species - the primary commercial reforestation species in Alberta are lodgepole pine and white spruce. Generally, reforestation species are selected to match mature trees surrounding the planting (reclamation) site.
- size of seedling - nurseries produce an array of seedling sizes using a range of "seedling containers". Seedling and container sizes are chosen to match reclamation site conditions. For example, smaller seedlings grown in smaller containers are less costly to grow, transport and plant but do not perform well if faced with competing vegetation. Larger seedlings may be more costly but are far more likely to survive in a competitive environment. Another example is using shallower containers to produce seedlings for rocky sites where planting is difficult.
- seedling age - varies between 1 and 2 growing seasons. One year old seedlings (1+0 stock) is generally deployed while actively growing so is better suited to planting in the late spring. Two year old seedlings (2+0) are deployed when seedling top growth has ended so are generally plant in early to mid summer. Seedling age is an important consideration in suiting stock to dealing with competition, exposure and moisture stress; and
- seedling growing regime - which is used to set seedlings up for challenging sites, for example sites with high wind exposure or significant risk of frost heaving.

All of these considerations can be more fully addressed in conversation with a silviculturist or by referring to the Alberta Mixedwood Silviculture Guide available free of charge from the Mixedwood Management of Alberta

<http://www.rr.ualberta.ca/en/Research/MixedWoodManagementAssociation.aspx>

Ordering planting stock

A few thousand seedlings from a specific seed zone for a typical wellsite is a very small order for a commercial seedling nursery. Consider grouping sites to increase order size and gain economies of scale. Alternatively, contact a local forest products company. These companies place large orders for seedlings and you may be able to purchase seedlings through them. Local silviculturists should be able to recommend a seedling container size and age suitable for wellsite reclamation.

Handling and transporting planting stock

Once lifted from the nursery, seedlings should be delivered and planted as soon as possible. While being transported from the nursery and stored on site seedlings should be kept cool. If seedlings are to be stored for more than a few hours, place them in a shaded area, open the seedling boxes and ensure the root plugs are moist. Where shade is not available, cover the seedling boxes with reflective tarps (Photo 2). Be sure to leave room for air circulation under the tarp.



Figure 2. Seedlings stored under a reflective tarp.

Seedlings are transported from nurseries in refrigerated vans. Field delivery to the planting site is done by pick-up truck, ATV and often helicopter. In all cases, minimize rough handling of seedlings. Physiological stress and physical damage are cumulative in effect and will affect seedling survival and growth.

Tree planting

Seedlings are normally planted by hand (Photo 3). Forest products companies employ tree planting contractors to do this work. These contractors provide trained tree planters, logistic support and knowledgeable stock handling. When planting well sites ensure that the planting contractor realizes that reclamation planting involves small crews moving to multiple sites. This requires more attention to logistics of crew and seedling transport than larger crews working in cutblocks.

Planting contractors have safety plans and processes, however reclamation planting may have different hazards and safety requirements that need to be discussed at contract time. Pay for tree planting can be either piece rate, by the hour or by the day.

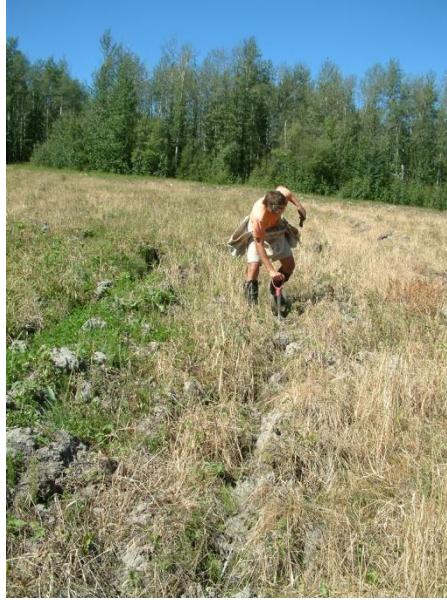


Figure3: Tree planter on a wellsite

The first priority in planting is to ensure that each tree is planted in the best available microsite, within the limits of the spacing requirements¹. Allow the planters some flexibility on inter-tree spacing as selection of suitable microsites is critical to seedling survival and growth. The best microsite provides moisture, nutrients, light, and warmth to the seedling. This means planting a seedling mid-slope at the micro level, where roots will not dry out or be flooded. Rocks, lumps of soil, or logs and stumps absorb heat from the sun during the daytime and radiate that heat at night. A seedling planted next to these obstacles stays warmer during the night, so has more energy for establishment and growth. Obstacles also reduce the wind at ground level, and catch snow during the winter, further protecting the planted seedling.

At the chosen microsite, *the seedling needs to be planted correctly*. First, the planting hole needs to be deep enough that the seedling is planted to the top of the root plug. If any portion of the root plug is exposed to the sun and wind the roots will dry out quickly, killing the seedling. If the hole is too shallow, the planter may have to force the root plug into the hole, damaging the roots, or causing the roots to bend upwards – a condition known as a "J-root". This impairs the future growth of the seedling. Planting deep is better than shallow.

After backfilling around the root plug with soil the seedling should be upright and firmly placed, with no air pockets around the roots. Often bark, moss and leaf litter are used for backfilling. These materials are not suitable as they are highly aerated so result in the root plug drying out. J-roots, air pockets and poor backfilling can be judged by digging up a sample of seedlings to check the root position, and then replanting the seedling. Firmness can be checked by pulling gently on the top of the seedling. Seedlings that have not been backfilled properly or with unsuitable materials will easily lift out of the ground.

¹ Spacing between seedlings is determined as the square root of the area that the seedling occupies (10,000 square metres/hectare divided by 2000 seedlings per hectare equals 5 square metres – the area occupied by each seedling. The spacing between seedlings will be the square root of 5 metres, which is 2.2 metres).

Examine the seedlings for upright position and broken tops. All of the above items are considered planting faults and should be discussed directly with the tree planter.

Reclamation practitioners unfamiliar with tree planting programs, and lacking experience with assessing suitable microsites, tree spacing, planting quality or payment, should discuss this with a local silviculturist. A few days assisting on an operational tree planting program would be a good opportunity to learn about microsite selection, assessing planting quality, stock handling and project management.

Consult with forest companies or ESRD representatives to get an idea of expected tree planting rates for the area, keeping in mind that planting a number of small sites will incur more travel costs relative to planting larger forest harvest areas.

Planting Deciduous Cuttings

Another source of woody vegetation for wellsite reclamation is the use of deciduous tree cuttings. In Alberta, both willow and balsam poplar will grow from vegetative cuttings (also called whips).

Collecting Cuttings

As with coniferous seedlings, the Standards for Tree Improvement in Alberta regulate the deployment of deciduous cuttings. The standards require that cuttings be taken from within 5 km and 100 metres elevation of the target planting site.

Whips should be collected in early spring (mid-March to mid-April) from one-year-old growth. Use pruning shears to cut off the previous summer's growth. Wrap the whole cuttings in plastic to avoid desiccation, and store in a freezer or root cellar at temperatures between - 3^o C to + 1^o C.

Planting Cuttings

In late May cut the whips into 15 to 20 cm long pieces - ensure that each of these short cuttings has several buds on it. Soak the cuttings in water for two days prior to planting.

Plant the cuttings vertically at the appropriate spacing by simply pushing the cutting into the ground if the soil is soft enough; otherwise use an implement that makes a deep enough hole. Ensure that one bud is above the ground level. Backfill soil against the stem of the cutting with the ball or heel of your foot to remove air pockets. Be cautious while backfilling; you should not be able to see a clear boot imprint in the soil. Two or more cuttings may need to be planted to ensure at least one survives.

Planting of deciduous cuttings should be completed by no later than the middle of June for best survival and growth. Survival of cuttings will be greatly improved by planting them into moist soil and by watering them in at the time of planting. Watering in can be accomplished by apply 3 to 5 liters of water each planting spot after cutting is placed.