Chapter 16 - “Stock Handling”

In this chapter, we'll look at stock handling. We'll talk about the preferred methods of handling boxes, the preferred on-site storage methods, and we'll demonstrate how to handle seedlings and bundles correctly.

Once the trees arrive on-site to your planting camp, in a large truck or reefer, tree planters are the primary link in handling the seedlings until they're finally planted in the spots where they'll spend the rest of their growing lives. This is the part of the seedlings' journey where stress can be most easily introduced, so it's important for us to treat the young trees with care.

Figure 16.01
Unloading a Shipment of Trees.

It is possible for a reefer to contain several different types of trees. Attention must be paid when unloading so the different tree types don’t get mixed up.

How you handle seedlings will directly affect their survival. From the time a seedling leaves the nursery, it's at risk. There are obvious ways to mishandle trees, but you shouldn't underestimate the effect that a series of small stresses can have on seedlings. Each stress is cumulative. Once weakened, a seedling has less resistance to future stresses that it will encounter once planted.

On Site Seedling Storage

Once the trees are at the site, they'll need to be taken care of in a manner that maintains their optimum temperature and moisture.

Figure 16.02
Refrigeration Unit.

This unit is what keeps the reefer trailer cool. It runs on diesel fuel, which is supplied by a tank attached to the underside of the reefer. It's very important for the supervisor not to let the fuel run dry in the reefer.

Figure 16.03
Reefer Thermostat.

This is a closeup of the thermostat on the reefer, which lets you control the temperature of the reefer.

Figure 16.04
Thermometer in Reefer.

This temperature probe shows a reading of about 3.5° Celsius. This is good. The best range is from about 0° C to 4° C.

Here are some basic rules for onsite seedling storage:

- Protect them from direct sunlight and temperature extremes.
- Thaw any frozen seedlings slowly and naturally, within closed boxes or under tarps. The roots and plugs of seedling bundles should never be exposed to direct sunlight and air flow.
- If the plugs of the seedlings aren't very moist, give them a bit of water occasionally. Don't soak them.
- Keep seedlings out of standing water or mud so their roots can breathe.
- Keep seedlings covered whenever possible, by natural shade, or by a reflective covering.
- Whenever possible, your main seedling cache should be a refrigerated trailer unit, referred to as a reefer. The temperature in the reefer should be maintained between one and four degrees Celsius.

This is the optimum temperature to store the trees, until they're removed from this main cache and moved into trucks for their trip to the blocks.

Figure 16.05
Summer Trees Stored in a Shade Tent.

While spring trees can remain on-site in a reefer, in some areas, some foresters still require that hot-lifted trees are unloaded into shade tents, especially if it's going to take more than four days for the trees to be planted.

Figure 16.06
Watering Trees.

Summer hot-lifted stock may need to be watered occasionally, if stored in a shade tent. This isn't the case if the boxes are kept in a reefer. The fact that reefer storage basically eliminates desiccation is one more reason why many foresters are starting to store summer trees in reefers.

Handling Seedling Boxes

Seedlings are sensitive to being crushed, and the trees undergo stress if the boxes are dropped. During transportation in trucks or on ATV's, rough access adds stress to the seedlings.

Figure 16.07
Passing Boxes Carefully.

It's important not to drop boxes of trees on the ground. Treat them like boxes of babies. After all, they are baby trees.

Here are some basic rules for handling seedling boxes:

- Handle boxes carefully, without dropping or throwing them. When unloading a reefer, slide them up the floor, and don't let the boxes crash out the end onto the ground.
- Keep the boxes upright, as seedlings can also be crushed when the boxes are crushed.
- If you need to stack boxes more than two boxes high, use a pattern of alternating orientation that strengthens the structural integrity of the pile.
- Keep the boxes closed when you're not bagging up.
- Don't sit on, stand on, or stack heavy objects on the boxes, if it causes the boxes to be crushed.
- Try not to let tree boxes get wet. The cardboard is treated with wax, but the boxes still degrade when wet, and they'll crush more easily. Storing trees in a reefer is always better than using a bush cache. Unfortunately, if trees are stored in traditional summer caches under shade tarps, it is inevitable that the boxes will get wet.

Figure 16.08
Using a Roller System.

A system of rollers reduces the amount of physical effort required to unload a truck, and is easier on the trees.

Figure 16.09
Working with a Roller System.

It's easier for this worker to slide the boxes out of the reefer on the rollers than it would be to throw them. Some foresters purchase sets of rollers and loan them to the planting companies that are working on their projects.

Figure 16.10
Elevating Boxes.

Although it is essentially impossible to elevate the boxes when you're working with a bush cache or shade tent, you may be able to elevate them if you're working out of a walk-in cooler facility in town.

Correct Handling of Seedlings and Bundles

The highest risks to seedlings are when you handle them in bundles while bagging up, and as individual seedlings while you're planting them.

Your trainer or crew leader will show you the proper way to load seedlings into your planting bags, also knowing as "bagging up." Depending where you're working, you may be asked to use reflective inserts known as "silvicools" in your planting bags, to keep seedlings cool. With the exception of your drawbag, which is the insert or inserts that you're actively drawing trees from, any other reserve inserts should be kept closed if it's a hot or sunny day. Don't come back to the cache to take a break while you still have trees in your bags. Make sure you bag out first, so seedlings aren't sitting in your bags for an unnecessary amount of time.

It is common on the coast, and in many areas where crews are comprised predominantly of vets who are able to complete a run in an hour or less, not to be required to use inserts. Inserts probably don't make any difference in terms of keeping your seedling plugs moist, especially if you're always bagging out fairly quickly.

Figure 16.11
Closed Inserts.

If you're working in a project where inserts are necessary, you'll probably be asked to keep them closed. Inserts are a holdover from a few decades ago, when bareroot planting was common. To be honest, I think they're a huge waste of time and money.

When you're planting, the process of moving a seedling from your bags to the hole can damage it in numerous ways. The laterals, needles, or the top bud (known as the leader) can be damaged. The roots can be shaken or bent with rough handling. Be gentle with the seedling as you're moving the tree out of your bags. At the end of the day, if you're stuck with some trees remaining in your bags, rewrap any loose trees, close the drawstrings on the inserts, and store the bags in a cool, safe place. Your trainer or crew leader will demonstrate the best way to handle the seedlings while you plant.

Figure 16.12
Bagging Up.

The process of loading bundles of trees into your bags is called "bagging up."

Some foresters prefer that you don't unwrap too many bundles at once. Often, the reason given is that the plugs will dry out faster. To be honest, unless you're taking more than a few hours to finish a bag-up, there is very little chance that desiccation is a significant risk to the plugs. A more legitimate reason not to unwrap too many bundles at once is that if you have soft plugs, they're more likely to shake apart in your planting bags if they're unwrapped. Early summer stock is the worst for this. Properly hardened plugs may have very minimal risk of falling apart. Regardless of the rationale, if the forester tells you to do something specific, pay attention. If they catch you breaking the rules, there can be fines or worse (including the nuclear option, getting booted off their contract).

Figure 16.13
Bundles of Trees.

Here, a planter is getting ready to load her bags with bundles of trees.

Some foresters go so far as to ask that only a single bundle be unwrapped at a time. Of course, if you're a proper ambidextrous planter, that's an issue. However, I've found that if you explain to a forester that you're an ambi planter, they're usually quite understanding and allow a bundle unwrapped on each side of your bags. I've also seen quite a few foresters who allow an entire drawbag to be unwrapped if the planter is generally planting it out within 30-45 minutes or less. Common sense usually prevails.

Some people like to "crack" the wrappers on every bundle as they bag up. The rationale is that technically, the bundles are all still wrapped. However, pulling seedlings out of partially cracked bundles usually results in more friction/resistance than if all the seedlings are loose in your bags, and this often causes more damage to the seedlings (plugs disintegrating, leaders being pulled off seedlings). Some foresters understand this issue, and prefer for you to unwrap your entire drawbag.

There was a lot of controversy in BC starting in 2024 with bundles that were shipped without bundle wrappers. These were referred to as "loose wrap." That was a bit of an odd name, since there was no wrap at all. Perhaps a better name would have been "loose pack" (which I think is what some foresters started using). Anyway, it was a very contentious evolution within the industry. Planters absolutely like to have unwrapped trees, but they prefer for those seedlings to be packed cohesively within a box, both for the convenience of loading trees into planting bags efficiently (all roots facing certain directions) and for being able to apportion boxes quickly. On the first point, if the box ever tipped over before arriving at the planter's cache, the seedlings could be a jumbled mess – bad for stock-handling but terrible for loading into planting bags quickly. Also, if two planters want to split a box, it's far easier to quickly grab six bundles of 15 trees each than it is to methodically count out exactly 90 trees. Planters want speed and efficiency, and although the ability to have a completely unbundled load of seedlings in your planting bags is great, the inefficiencies during bagging up and counting part-boxes more than offsets that gain. However, it is likely that the industry will continue to move further away from using wrapped bundles. After all, the amount of single-use plastic waste created by sending fifteen to twenty million strips of plastic to BC landfills every year was an environmental travesty.

A bit of jostling around is inevitable for the seedlings. However, we want to avoid unnecessary violence. By treating them with some respect, you can have a significant effect on improving their survival rate. Just like people, young trees are more susceptible to being hurt than mature trees. Treat a box of trees just like it's a box of babies. You don't want to be throwing boxes of babies around.

Here are some tips for bagging up:

- Foresters don't like to see upside-down bundles. Bundles that are perfectly vertical are hard for planters to grab (and run the risk of the leader tips being pulled off the seedlings). The best way to bag up is to put bundles into your bags at an angle. This way, you can grab them by the plug but not run the risk of having a forester get upset at your bagging-up technique.
- Foresters don't like to see over-stuffed bags. If you think there's a risk of that, perhaps it makes sense to spread them out and put some bundles into your back bag(s), even though it feels a bit heavier on your back.
- If you are emptying loose dirt and fertilizer/vermiculite out of your bags at the cache, don't dump it in an obvious pile on the ground. A forester could come along and notice, and will realize that dirt comes from shredded plugs in your planting bags. It's best to throw or kick this dirt away, so it's not so obvious.
- After bagging up, check to make sure that you put the tarp back onto the cache properly, and that the corners are weighed down with sticks or rocks (so it doesn't blow off in the wind).
- Once you strap your bags on, do a quick 360° turn to look around you and make sure you didn't spill any loose trees on the ground at the cache.

One final note with respect to a pet peeve about caches: The "cache" is the location where your trees and gear are stored temporarily during the work day. It is spelled cache, not cash. Don't hang out at

the cache. You don't make cash if you waste time at the cache. The word "cache" might originate from French Canadian fur trappers, who used the word "cacher" (to hide/hoard). I'm not certain. I'm not about to hang around at the cache to discuss it.

Building Caches on Blocks

It is common for foresters to require that trees be tarped at caches on the blocks. If you're working with spring trees, they'll probably ask that you wrap the boxes completely so the sun can't hit them. Some people refer to these as gift-wrapped caches, as the trees are top and sides of the boxes are wrapped up by the wrap as if they're a holiday gift.

Summer trees may be treated differently. In some areas, gift-wrapped is fine. In other areas, foresters ask for air flow to the boxes. This can be accomplished in one of two ways, either by suspending a tarp over the boxes, or by building an A-frame style cache. The A-frame is usually easier to build, especially if your tarps are large enough (12' x 15' tarps are great for this type of cache).

Figure 16.14
An Elevated Cache.

This type of cache is usually referred to as an elevated cache or suspended cache, because the tarp is suspended above the boxes with some sticks and short pieces of rope.

Figure 16.15
An A-Frame Cache.

The A-frame cache is usually easier to build than a suspended cache, and it's a lot sturdier when the wind starts to pick up. I always recommend that people build A-frames if we're planting hot-lifted trees. Make sure the "opening" of the cache faces to the north.

Unloading a Reefer

Speaking of pet peeves, planters and management spend a tremendous number of labour hours each year moving boxes around: Out of the reefer, into a main cache, out of the main cache, into a truck, back out of the truck at the block, etc. Despite all the energy expended, it is very common to see people wasting energy when handling and movement can be approached more efficiently.

Figure 16.16
Inside A Reefer.

A reefer can hold a lot of boxes, sometimes 1000+. They can be packed with an aisle up the middle, or in compact sideways rows. Normally, boxes are not spaced out like this during transportation, but this load was unfortunately still frozen solid when it arrived from Silvagro.

The most efficient way to empty a reefer is to have two people inside, ~~throwing~~ sliding boxes toward the doors (I'll call these two people the "muscle"), one person at the doors to catch the boxes and ensure that a box doesn't accidentally shoot out and hit the ground (I'll call this person the "regulator"), one or two people taking boxes off the back lip of the reefer and putting them onto the table for the rest of the crew to grab (I'll call this position the "funnel," and the rest of the crew acting as the "chain gang."

Figure 16.17
Working on the Chain Gang.

Although it sounds painful, unloading a reefer doesn't take very long when you have a motivated group of people. It helps when they're paid for their work. Free labour is no fun at all. Most good companies pay people for this type of labour, even if it's only minimum wage.

It is important that the "muscle" don't try to show off and put boxes out faster than they can be processed by the rest of the crew, or thrown too hard so the "regulator" is having difficulty stopping them. If you're in the role of the "muscle," you should treat it like you're playing a game of quarters at a table in a pub. In the pub, you want to slide your quarters as close to the edge of the table as possible, without letting them go over the edge. In the reefer, you want the boxes to slide far enough that the regulator doesn't have to come into the reefer to grab them, but at the same time, if the regulator's back is turned on a box, you don't want it to shoot out and fall onto the ground.

The regulator is the most likely point for an inefficient "bottleneck" to form. However, when one forms, it usually isn't the fault of the regulator. It's the fault of the muscle. This is a case where faster is slower. The muscle team need to make sure they put boxes out at a steady pace, but if they go too fast and the regulator gets backed up, the muscle has to pause, and the entire unloading operation loses time. It's also important for the muscle to alternate their turns to stagger the boxes a few seconds apart, giving the regulator time to adjust them into the perfect position for the people in the funnel position. If the two people in the muscle position throw their boxes at the same time, it's hard for the regulator to deal with.

Think of the best way to consistently orient your boxes to be convenient for the next person in the chain. If you're the regulator, and someone in the funnel position prefers to pull a box out of the reefer by the end of the box, orient them that way. If someone else prefers to two-hand the box out of the reefer by grabbing both ends at the same time, orient them that way.

Boxes should never be set on the ground if they subsequently have to be moved further. This would mean that someone has to pick them back up before moving them. You don't ever want to work against gravity. Moving boxes sideways (kinetic energy) requires far less exertion than moving boxes vertically (potential energy). A common place for this issue to arise is when someone is pulling boxes out of the tail end of the reefer and setting them on the ground, so other people can pick them up and move them into a shade tent or storage area. Rather than setting these boxes down on the ground, build a "table" of four boxes (two on the ground, then two more on top but facing at right angles). Make sure that people never take the "table" away. The rest of the boxes can be set on the table, where they're at a more convenient height for people to pick them up and move them along.

If you have enough people to create a chain, passing boxes along a chain is ultimately faster than everybody grabbing boxes chaotically out of the back of the reefer. Study queuing theory if you don't believe me. When using a chain, each person should face the opposite direction of the people on either side of them. This means that no one person has to make an exaggerated movement to do an inefficient 180^{o} pass. Each box moves up the line with a minimum of body movement of each participant in the chain. For a large reefer, it may make sense for everyone to reverse their orientation halfway through the unloading process. This gives everyone's body an equally distributed workout.

If you're unloading boxes into a shade tent, or cooler, you may be unloading several different request keys (different types of trees). If so, make sure that each request key is stacked or spread out in its own "block," to minimize the chance that someone grabbing boxes later on grabs the wrong type of tree. It often helps to leave a space between stacks or blocks of different request keys. It can also be helpful to use different colours of flagging tape to flag off where one request key ends and another begins.

Figure 16.18
Separating Tree Boxes.

Make sure that it's easier to distinguish different types of trees, by ensuring that the labels are facing the front of the cache, or by separating different groups of trees and ribboning them off with flagging tape.

If boxes need to be stacked, alternate their orientation with each row. This gives added structural integrity to the stack, and reduces the chance that boxes are crushed by other boxes on top of them.

Finally, if you're loading trees into a reefer, or into a cooler, or into the back of a truck, it's very important for other people to be able to tell what kind of trees they are. Make sure you spin EVERY box around so the labels (box-end stickers) are facing "out" where they can be seen easily.

Figure 16.19
Labels Should Be Facing Out.

This is one of the cardinal rules of tree planting. Box stickers are only attached to one end of each tree box. Make sure the boxes are oriented so the labels are facing out, so the crew leader or tree runner can more quickly see which boxes they need to grab.

Stock Labelling and Sizing

When examining seedlings in western Canada, any type of stock with roots grown in a plug format will have a three-digit number assigned to them which represents the size of the plugs. Common numbers are usually something like 310 or 412, often followed by a letter. The first digit in this number refers to the target plug size in centimeters, as measured by the width of the hole in the styroblock within which the plug is created. The second two digits refer to the target plug length in centimeters. In other words, a 310 is grown in a styrofoam container (called a styroblock) that has holes which are 3 centimeters wide and 10 centimeters deep. A 412 is 4 centimeters wide and 12cm deep. Sometimes the plugs "expand" a bit when they are lifted.

Finally, the letter after the plug size indicates the growing density of that specific styroblock. Different letters mean that there are a different number of seedlings grown in the same size block. As

an example, a 412A is not the same as a 412B. In the 412 family, an "A" block has fewer holes than a "B" block, meaning that each "A" seedling has more room to grow, and probably will have a thicker and more robust stem. Essentially, the letter gives you information about the above-ground quality and thickness of the seedling, even though the root dimensions for both types of 412's are the same.

Box Sizes

A "standard" tree box in western Canada is 24 inches in length, 12 inches in width, and 16 inches in height. Two boxes placed side-by-side therefore make a square which is two feet long on each side. As it is a square, two more boxes can be placed on top of it in the alternate orientation, and the resulting column is still square and two feet on each side. This stacking pattern is common when dealing with large quantities of trees. Alternating the orientation gives structural integrity to the pile, and it is usually quite easy to stack five or even six layers high without the stack collapsing under its own weight.

There are other non-standard box heights which have the same footprint (24" length, 12" width) as a standard box. We call them "short regulars" or "twelve-inch boxes" if they are 12" rather than 16" in height, and we call them "tall boxes" or "nineteen-inch" boxes if they are 19" rather than 16" in height. Not surprisingly, twelve-inch boxes are usually used with very small stock such as 211's or 311's, and tall boxes are usually used with very tall stock (415's and any type of 2+0 stock which is more than a year old).

Finally, "stubby" boxes are also quite common nowadays. They're well-suited for medium sized trees which are strong enough to be packed very tightly together in the box. Stubby boxes are predominantly used for over-wintered spring stock rather than for hot-lifted summer trees (which need to breath). A stubby box is the same height but only ¾ the length of a standard box, ie. 18 inches in length, 12 inches in width, and 16 inches in height.

Understanding Seedlots & Request Keys

Trees in Western Canada are often distinguished by three different metrics: Species, Seedlot, and Request Key. The species is obvious: Pine trees are different than spruce trees. However, there can be assorted species of pine or spruce, and even more confusing, there can be different types of trees within a single species. For example, there can be three or four different types of lodgepole pine in a single load. Due to this, a "seedlot" number is used.

A single seedlot consists of trees of a certain type, from a certain area, which were all grown from the same seed source. For example, if there are three types of lodgepole pine seedlots, each one of those was probably sourced from seed from a different area, perhaps from different elevations.

Finally, the request key allows us to break up a seedlot into sub-groups. Each request key identifies a very specific order from a very specific nursery. One seedlot can have multiple request keys. For example, if West Fraser is buying 8 million lodgepole pine trees of seedlot 65874, and they are trying to split up their risk, they may order the trees from four separate nurseries. Each one of those nurseries will supply 2 million trees of the same seedlot, all taken from the same seed source that was provided by West Fraser, but each of the four orders has a unique request key so the trees can be tracked separately. Planting companies typically have to map the locations of the various request keys if multiple request keys are mixed on a block. This is for accountability. If a lot of the trees die, the forester can look at the mortality and see if they were all from one specific seedlot. If that's the case, they can go back to the nursery to discuss the situation. When loading or unloading trees, it's always important to make sure you aren't mixing up various types of trees that should be kept apart from each other.

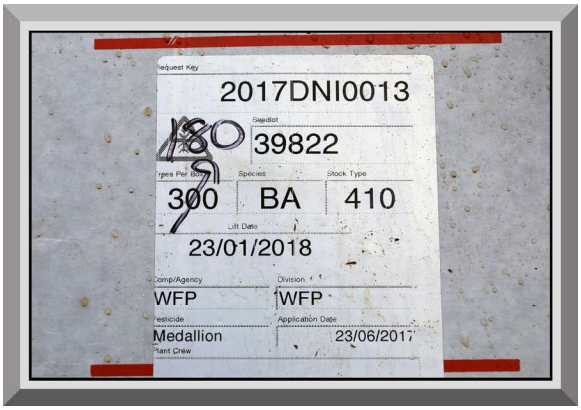

Figure 16.20
Box-End Label.

This box-end sticker shows quite a bit of information, including the request key, seedlot, species, number of trees, stock type, client, and more.

I-wrap Stock

Some trees are bundled in a very unique way in the fall. This type of packaging, known as I-wraps, features a very long bundle wrapper that is intertwined between each individual seedling in the bundle, so none of the plugs are actually touching each other. A planter is able to pull apart a frozen bundle and each seedling will come apart relatively easily while still individually frozen. The trees can then be planted while the plug is still frozen (or semi-thawed), which minimizes the risk of j-roots (a type of quality fault).

There are pros and cons to planting I-wraps. Here are some of the benefits:

- Fewer j-roots.
- Seedlings are less susceptible to root damage.
- Managers don't have to plan for a ten-day thaw window in advance, because trees can remain frozen during delivery and up until the day of planting.

Here are some of the drawbacks:

- Seedlings are usually given extreme amounts of water before going into the freezer, to assist with the freezing process. Unfortunately, this means that the trees are especially heavy in

planters' bags, which in some cases is leading to WorkSafe injury management issues. Also, a load of especially heavy boxes can exceed the legal carrying capacity of a pickup, and make it more susceptible to rollover accidents.

- A reefer temperature has to be maintained carefully. A mix of frozen and regular seedlings can be stored in the same reefer if the temperature is maintained around 0-2 degrees. Any warmer than this, and the I-wraps might start to thaw out prematurely. If the reefer contains traditional wrapped bundles which are inadequately thawed, the reefer may need to be set to 4 degrees to finish thawing that stock, but this setting also starts to thaw the I-wraps. This isn't an issue when regular stock is thawed properly prior to loading in a reefer, but unfortunately it is quite common for planting companies to have issues with frozen regular stock in May.
- If the bundles aren't wrapped carefully, with plastic completely surrounding each plug top-to-bottom, there can be issues with the tops or bottoms of adjoining plugs sticking to each other (frozen) and when planters pull the bundle apart, this rips the root systems. This can be mitigated by "partially thawing" the load. The tops and bottoms of bundles always thaw first, while the core stays frozen longer.
- More plastics are generated, which fills up landfills.
- Slightly more handling time for planters, because it may take a bit longer to unwrap the bundles (although I haven't always found that this is the case).
- More time spent dead-walking on blocks. Heavier trees leads to lighter bag-ups, which means you have to come back to the cache more often.
- Planters sometimes tend to have significant quality issues with roots AFTER the Iwrap stock is complete and they've moved back to regular stock, because they're accustomed to jamming the plugs into the ground with no considering for keeping roots straight.

Larch seedlings in particular are very susceptible to flushing (the release of new leaves/needles) very shortly after they are thawed. Therefore, planting trees while still frozen is an especially beneficial approach when working with larch.

For a few years, the nurseries seemed to be trying to push the iWrap concept quite hard in southern and central BC. More recently, it appears that the prevalence of I-wraps is actually diminishing. When planning for recent seasons, some foresters have mentioned that even some of the larch stock would not be I-wrapped. Whether or not this is a trend rather than a localized logistical issue remains to be seen.

For more photo and video resources associated with this chapter of the book, including a tour of a forest seedling nursery, visit:
www.replant.ca/training/stockhandling