

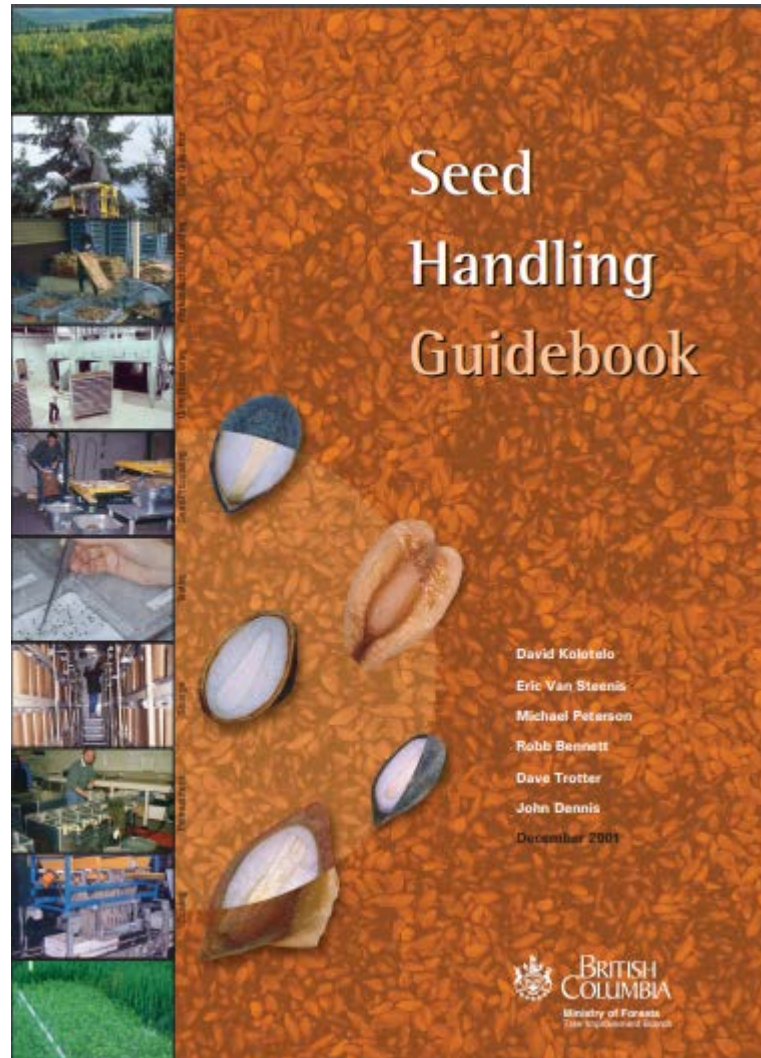
SEED USE EFFICIENCY IN THE NURSERY

October 17, 2018



Western Forest Products Inc.
DEFINING A HIGHER STANDARD™





Definitions

- Seed Use Efficiency - the ability to avoid wasting materials, energy, efforts, money, and time in producing a plantable seedling
 - How do we use the least amount of seed to produce a requested amount of seedlings?
 - Different than seed effectiveness, which is the best use of seed in limited supply (i.e. where should it be allocated?)

- Sowing Factor – number of seeds supplied per cavity

- Oversow – additional cavities (blocks) sown above requested amount

- Peak Value (PV) – used to describe vigour (77% germ in 7 days)

How Many Seeds Per Cavity?

- Adjust Sowing Factor so number of viable seeds per cavity close to 100%
- BC Ministry of Forests sowing guidelines
 - Probability equations used to calculate seeds per cavity to minimize empties
 - 95% GC single sow = 5% empties, 2x sow (0.05×0.05) = 0.25% empties
 - 100 additional seeds = 5 additional filled cavities
 - ↑ thinning cost
- Fractional Sowing
 - Strategically seal holes with tape or “stickies” to create desired ratio of spc
 - 95% GC 1.5 sow (0.05 to 1.5th power) = 2.6% empties
 - Provides seedlings for transplanting at thinning
- Various Scenarios
 - Single sow and increase the oversow to account for empty cavities
 - GH “buying greenhouse space” vs. outdoor compound
 - Container size

Put It All Together

- Seedling request in cavities x SF x Oversow x Nursery Handling Factor
 - SPAR allocates 0.2 extra seeds supplied per cavity
 - Adjust for just enough to sow 5 extra blocks to run sowing line out
 - Add % for small requests

- Determine seed requirements upfront prior to seed being withdrawn, soaked and stratified
 - However, seed can be returned to TSC, dried back and stored for future use

SPR200 Nursery Gram Adjustment



Search	Lot Info	Requests	Reports	Services	Maintenance	TSC	Registration	Admin
--------	----------	----------	---------	----------	-------------	-----	--------------	-------

Request ID: (All other criteria will be ignored if request key is given)

Assigned Nursery: SAANICH FORESTRY CENTRE

Request Agency:

Species:

Stock Type: Container Type:

Planting Year: Season:

Stock Age:

7 rows returned

Request ID	Lot	Species	Nursery	Stock Type	Cntr Type	Stock Age	Plant Year	Season	Request Agency	Seedlings (000's)	Grams			
2019DCR0036	35133	YC	WFP	PSB	410	100000	2019	SU	WFP 11	15.1	256	<input type="text"/>	Save	Cancel
2019DSI0049	46542	YC	WFP	PSB	410	100000	2019	SU	WFP 11	10.3	191	<input type="button" value="Update"/>	<input type="button" value="Details"/>	
2019DNI0033	46243	YC	WFP	PSB	410	100000	2019	SU	WFP 11	15.2	302	<input type="button" value="Update"/>	<input type="button" value="Details"/>	
2019DNI0037	43700	YC	WFP	PSB	410	100000	2019	SU	WFP 11	12.5	322	<input type="button" value="Update"/>	<input type="button" value="Details"/>	
2019DNI0035	45167	YC	WFP	PSB	410	100000	2019	SU	WFP 11	22.3	449	<input type="button" value="Update"/>	<input type="button" value="Details"/>	
2019DNI0036	46246	YC	WFP	PSB	410	100000	2019	SU	WFP 11	15.3	383	<input type="button" value="Update"/>	<input type="button" value="Details"/>	
2019DNI0034	46244	YC	WFP	PSB	410	100000	2019	SU	WFP 11	11.2	258	<input type="button" value="Update"/>	<input type="button" value="Details"/>	

Sowing Machinery

- Accuracy
 - Previous calculations assume sowing machine fills cavities exactly as desired
- Vancouver Bio-Machine vacuum drum seeder is somewhat crude, but has and continues to perform well
- Various precision seeders have been used in BC nurseries
 - BCC
 - Mosa
 - Booth – ejects with water
- Often supplemented by hand on sowing line with large seeded species
- Seed placement – centre of cavity
 - 2 sets of tampers, pointed - ↑ grit

You've Determined How Many Seeds to Request

- Check sowing dates in SPAR are correct
 - Too soon, seed may germinate in the bag
 - Put request in SPAR in sufficient time to ensure proper stratification

- Start with clean, properly stratified seed with accurate germination stats

- Kudos to the TSC for doing such an excellent job!
 - Very fortunate to have access to this world class facility and services

- Retain Seed Vigour
 - Proper transport (e.g. Styrofoam container with ice pack)
 - Immediately check seed upon arrival
 - Package into smaller bags, open, refrigerate (alarm), rotate
 - Nursery germination tests
 - Difficult to replicate TSC environment

Sowing

- Upgrade poor germination seedlots (e.g. Ba)
 - Throwing out seed to ↑ germ = lower SF
- 24 hour aerated soak and surface dry prior to sowing
 - Recommended on immature seedlots (i.e. picked early)
- Chemical treatment such as hydrogen peroxide soak
 - May help if Fusarium et al causing damping off?
- “Baby Powder” on sowing line to prevent seed clumping
- Don’t leave partial bags of seeds out on the sowing line overnight
- Mist
 - On sowing line
 - Upon arrival in greenhouse
 - Just enough
- Saturate blocks with water after sowing

Uniformity



Growing Environment

Wait until GH full before raising temp

- Compress germination period with continuous high temp 25° C
 - Air temperature vs. peat temperature
 - Underbench heating

- High humidity, reduce fans – less evaporative cooling

- Pelletized Cw
 - Keep material coating seed moist
 - Seed often “floats” to the top of the grit

Forester's Influence

- Stock type
 - Cavity size

- Amount ordered

- Summer planting date

- Specifications

- Overruns
 - Oversow management

Predators and Disease





Forester's Influence

- Stock type
 - Cavity size
- Amount ordered
- Summer planting date
- Specifications
- Overruns

- Oversight management
 - Grow 98 – 102% of request
 - Plant all overruns
- Seedling specifications
 - Why do we grow seedlings?
 - \$1.00 to put a tree in the ground
 - Reasonable

- Mini-plugs→ Growth Rooms→ Automated Transplanting

Questions?

