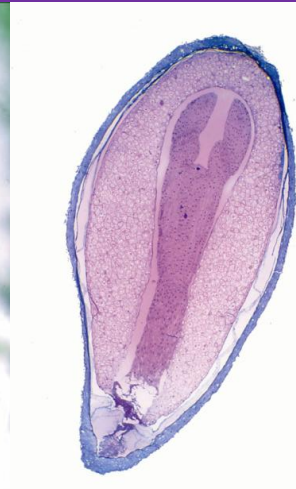
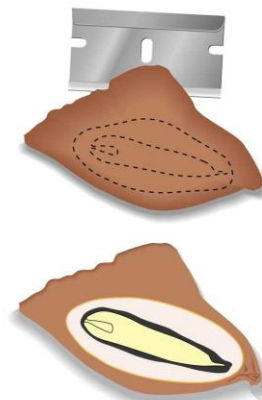
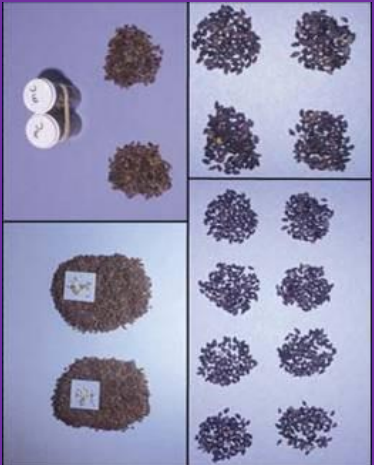


# Is ISTA Relevant for Tree Seed Testing in Canada?



## TREE SEED

"HANDLE"  
WITH CARE

"STORE"  
IN COOL AREA  
OPEN UPON RECEIPT



## PERISHABLE

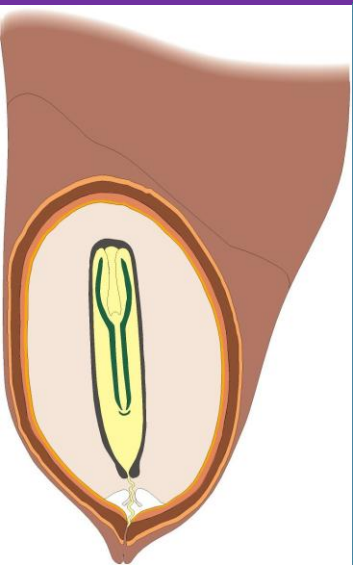


**Dave Kolotelo**  
[Dave.Kolotelo@gov.bc.ca](mailto:Dave.Kolotelo@gov.bc.ca)  
ISTA Annual Meeting 2026  
Calgary, Alberta, CANADA



# Talk Overview

- Canada overview / British Columbia
- BC Tree Seed Testing
- FTS History Lesson
- BC Testing Priorities



# Canada and Tree Seeds



- Most tree seeds in Canada are used domestically
- For seed exports we have a Seeds Act and Plant Protection Act
- These Acts and associated regulations fall under the Canadian Food Inspection Agency (CFIA) – ‘focus’ is on Agricultural seeds
- Canada is a signatory of the OECD Forest Seed and Plant scheme
- GMO’s are not available for conifer seedling production
- In 2023 Canada planted 563 M seedlings
- Provinces have jurisdiction over natural resources like our forests (except some Parks)
  - Huge country – over 5000 km wide
  - Trees have long rotations 50 to 100 years
  - Regulated seed transfer to maintain growth AND survival
  - Climate change is happening faster than trees can migrate
  - Assisted migration is happening in some jurisdictions
  - Local seed may no longer be best, more local control is best



# Tree Seed Working Group



**Tree Seed Working Group  
News Bulletin 78**  
July 2026  
Canadian Forest Genetics Association  
Association canadienne de génétique forestière

**SEED COLLECTION**

**Featured in this Issue**

2	Armchair Report	26	Impact of ISO 9001 Certification on Operations at the Berthier Tree Seed Centre (Quebec)
3	Tree Seed Working Group Committee	27	Working Together for Conservation
3	Tree Seed Working Group Bulletin Distribution list	28	Cryogenics at the National Tree Seed Centre
3	Reproductive Biology Resources	31	Forests Canada's Tree Seed Business
5	Maturation Indices	32	A Douglas-fir seed-derived Trichoderma strain reduces Fusarium root rot under nursery conditions: First operational trial results
7	Expanding tree seed supply in the U.S. Pacific Northwest	36	Love You to the Moon and Back
9	Quercus Collecting Notes		Sowing seeds of hope: How the Nature Trust's seed collection project is safeguarding endangered trees for future generations
12	From Cone Collection to Reforestation: Gathering Seeds for the Future of Ticho Lands	38	
15	Splitrock Environmental	40	Don Pigott's Retirement Party
17	Turning Thinning Operations into Seed Collection Opportunities in southern Ontario	42	Bevin Wigmore retirement party
19	Seed Technology and Continuous Improvement	42	UPCOMING MEETINGS
19	An Ambitious Action Plan to Optimize the Quality and Quantity of Cone Harvests in Quebec	43	RECENT PUBLICATIONS
20	Across the finish line: an IPM guide to the cone crop marathon		

**OBJECTIVES:** To promote tree seed science and technology through:

1. Seed research from bud initiation to seed utilization
2. Identification of seed problems relating to tree improvement and forest management
3. The exchange of information on seed related problems
4. Advising on implementation practices

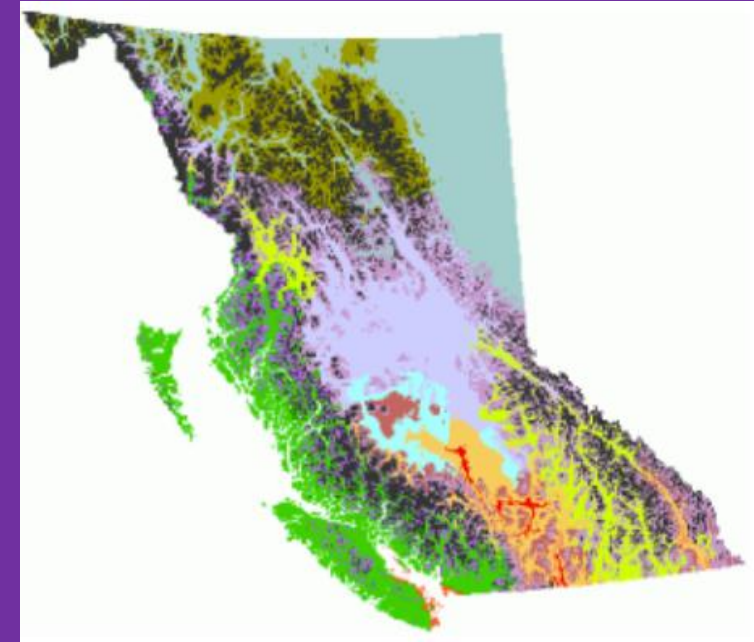


**Host biennial workshop and our biannual News Bulletin  
Contact Dave to get on distribution list**



# British Columbia (BC)

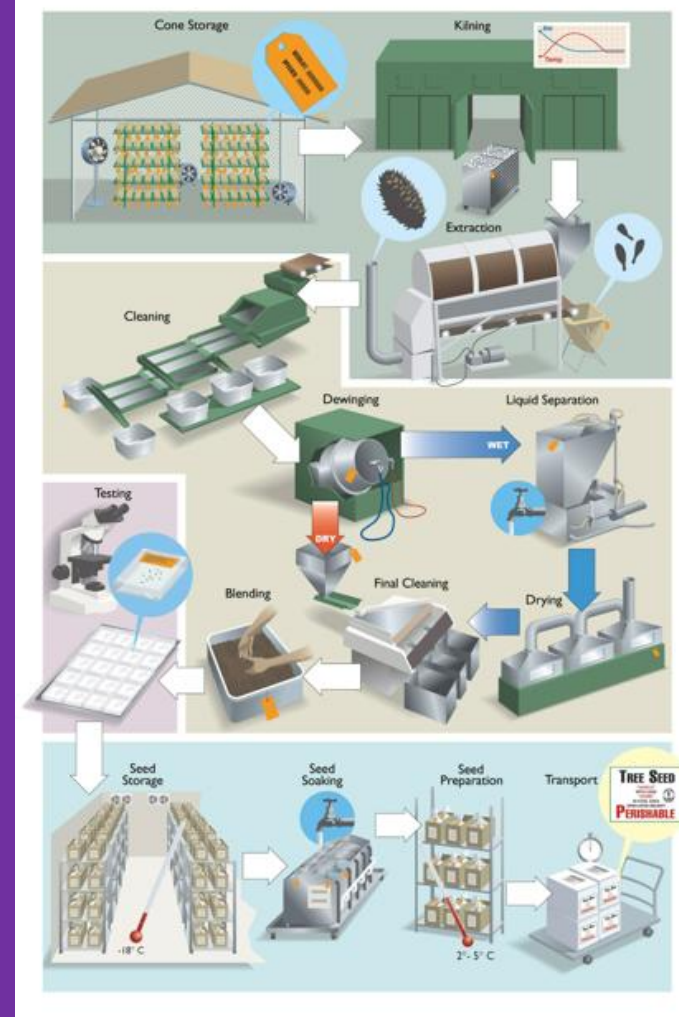
- Most of Canada is comprised of boreal forest, not BC
- BC has a complex ecology and topography
- In 2023 BC planted 46% of seedlings in Canada
- In 2026 over 70% of seed derived from seed orchards
- Seed is owned by those having reforestation obligations
- Primary regulation in BC is the Chief Foresters Standards for Seed Use (Testing, seed transfer+++)
- All testing done at provincial Tree Seed Centre
- **Purity** : > 97% pure seed by weight (most 99+%)
- **Moisture Content** : 4.0 - 9.9% (almost all <8%)
- **Seed Size** – we use seeds per gram (SPG) not 1000SW
- **Germination** – wide range of tree species and test types
- **Fungal Assays** – traditional plating – *Caloscypha fulgens*, *Sirococcus conigenus* and *Fusarium* spp
- Tetrazolium test reserved for extreme, time sensitive questions (cooler → freezer)



Biogeoclimatic zones of BC

# BC Tree Seed Centre

- Deliver “Excellence in Cone and Seed Services”
- Scope is basically the Seed Handling System / trees
  - **Cone and Seed Processing \$**
  - **Seed Storage** (70 000 Kg; 5640 SL; 7 B trees; 112 M \$CDN)
  - **Testing** (oldest seedlot from 1957 still performs well)
  - **Stratification / pelleting on contract \$**
  - **Genetic Conservation / Research**
- **April 1/24 to March 31/25**
  - 4088 tests performed (81 = 2% Out Of Tolerance)
  - 2271 germination tests (63 = 2.8% Out Of Tolerance)
- Most species we test have some physiological dormancy
- Match Testing and seed pretreatment (95% of requests)
  - Seed soaking in both environments
- Do not use weighted replicates for small seeded species, all 4 X 100



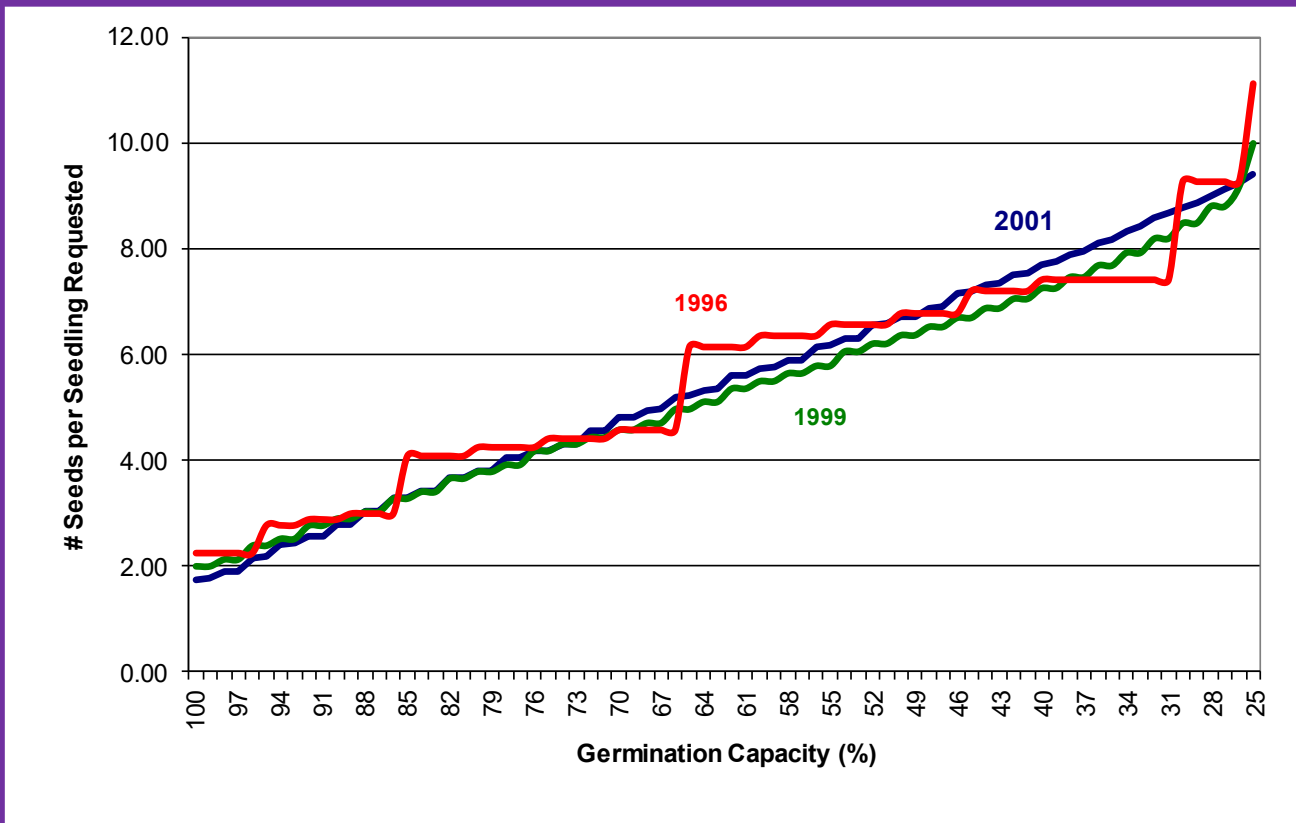
# BC TSC Testing

- Large differences between ISTA and our germination tests for:
  - *Pinus albicaulis*
  - *Pinus monticola*
  - *Callitropsis nootkatensis*
  - *Abies lasiocarpa*, *Abies amabilis*
- No significant International trade – *ISTA scope expanding???* !!!
- *Some reluctance for more complicated dormancy breaking treatments involving MC changes, warm stratification and long durations*
- *Inherent variability of trees – Seedlot X Treatment interactions are normal*
  - *Extended stratification*
  - *Temperature regimes*
  - *Sanitation treatment impacts*

# How are test results used?

- Making conversion from seedling requested to grams of seed to withdraw
- Sowing **Guidelines** – encourage seed use efficiency (40 M seedlings of seed savings annually)
- **Grams = # seedlings requested \* Seeds / seedling**

## Seeds per Gram



Germination Capacity (%)	Sowing Factor	Correction (Oversow) Factor	Nursery Handling Factor	Seeds Supplied Per Seedling
100-99	1.2	1.25	0.20	1.76
98-97	1.4	1.27	0.20	1.91
<b>96-95</b>	1.6	1.27	0.20	<b>2.18</b>
94-93	1.7	1.28	0.20	2.42
92-91	1.9	1.27	0.20	2.56
90-89	2.0	1.26	0.20	2.78

These sowing guidelines are generated through an open database (SPAR)



# Test Details : CONSEP

Request ID: TST20230281 Item: A Activity: G10 germination test Seedlot: 64045 Species: SX Germ Tray: 27748

Rank:  Category: Standard Germinator ID: 2

Germination %: 92 GV: 36.00 PV: 82/10 Repts out of tolerance:  Accept?

Comments:  Comment Is Critical Complete?

New seedlot retest

Activities	Begin Date	soak end	dryback	warm strat	cold strat	Into Germinator	Test End
Withdrawal	2023-05-09						
G10 germination test	2023-05-11	2023-05-12			2023-05-12	2023-06-02	2023-06-23 11:35:08 AM

Date	2023-06-05	2023-06-07	2023-06-09	2023-06-12	2023-06-14	2023-06-16	2023-06-19	2023-06-21	2023-06-23	Rep Total
Day	3	5	7	10	12	14	17	19	21	
1.	0	0	22	55	7	2	3	2	0	91
2.	0	0	27	56	6	3	3	0	0	95
3.	0	0	14	72	2	1	3	0	0	92
4.	0	0	16	67	4	2	2	1	0	92

Daily Germination

Rep	# Segs	Override?	Accept?
1	100	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	100	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	100	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	100	<input type="checkbox"/>	<input checked="" type="checkbox"/>

To Seedlot

To Request

Copy Results

Replicate Total 91% 95% 92% 92%

Final Abnormals Rank Curve Test Hi

Total Abnormals by Replicate

Replicate	RE	STR	STH	ROT	THH	THR	TW	WK	CM	OTH	PRE	Total
Replicate 1:	0	1	0	0	0	0	0	2	0	0	0	3
Replicate 2:	0	0	0	0	0	0	0	0	0	0	0	0
Replicate 3:	0	1	0	0	0	0	0	0	0	0	0	1
Replicate 4:	0	1	0	0	0	0	0	2	0	0	0	3
Totals:	0	3	0	0	0	0	0	4	0	0	0	7

# SPAR : Inventory, order entry, tests

CBST Owners Tests Commitments Transactions Heritage

Seedlot Number: 64045 Registered: Yes - 2023-05-29 - Active

Species: SX - spruce hybrid

Genetic Class/Worth: A IWS+64 GVO+27

Collection Year: 2022

Source Information

Orchard No: 211 - VERNON - WEEVIL

Tested Parent Trees: Yes Heritage: Yes

BEC Zone/Subzone/Variant: SBS wk 1 BEC Version: 10

Quantity and Test Information

Germination (%): 92 Peak Value: 85/10

Seeds per Gram: 475 Seedlings per Gram: 185

Potential Trees (000's): Grams:

Reserved Available: 18,992.0 102,357

Surplus Available: 0.0 0

Total Available: 18,992.0 102,357

Reserved Committed: -346.0 -1,865

Surplus Committed: 0.0 0

Total Committed: -346.0 -1,865

Total Quantity: 18,646.0 100,492

Agency: Multiple Owners

Collection Information

Collector: VERNONSO - 00 - VERNON SEED ORCHARD COMPANY LIMITED

Collection Start Date: 2022-08-09 Collection End Date: 2022-08-31

Collection Method: 06 - Ground, Ladder and/or Hydraulic Lift Collection Method 2:

Collection Source: Effective Population Size: 22.4

Ranked Current Tests

Seedlot Number: 64045 Species: SX - spruce hybrid

Germ Test Date: 2023-07-21 Germ %: 92

Type: G12 Moisture %: 6

Seeds per Gram: 475 PV: 85/10

Purity %: 99.9

Current Tests

Date	Type	Germ %	Rank	PV	Other Result	Description
2023-07-21	G12	92	A	85/10		24hr soak, 42dy Strat, 21dy Count
2023-06-23	G10	92	A	82/10		24hr Soak, 21dy Strat, 21dy Count
2024-01-09	SIR				0.0	Sirococcus fungal assay test
2023-12-22	FUS				1.2	Fusarium fungal assay test
2023-03-17	MC				6.0	Moisture content expressed as a percentage
2023-03-17	PUR				99.9	Percentage pure seed by weight
2023-03-17	SPG				475.0	Number of seeds per gram weight

Noncurrent Tests

Date	Type	Germ %	Rank	PV	Other Result	Description
2023-05-26	G10	93	A	78/9		24hr Soak, 21dy Strat, 21dy Count
2023-05-26	G12	94	A	82/10		24hr soak, 42dy Strat, 21dy Count

Request ID: CSP20230012 Item: A Activity: Purity Seedlot: 64045

Start Date/Time: 2023-03-17 Category: Standard Accept?

End Date/Time: 2023-03-17 Moisture Status:  Complete?

Result: 99.9000 Override?

Comments: 1 Pk seed in rep 1.

Replicate	Pure Seed Weight	Inert Matter Weight	Other Seed Weight	Accept?	Purity	OK
1	7.226	0.005	0.000	<input checked="" type="checkbox"/>	99.9%	<input checked="" type="checkbox"/>
2	7.860	0.005	0.000	<input checked="" type="checkbox"/>	99.9%	<input checked="" type="checkbox"/>

Impurities

Rank	Type
1	Broken Seed
2	Pitch

Request ID: CSP20230012 Item: A Activity: Average weight of 100 seeds Seedlot: 64045 Species: SX

Start Date/Time: 2023-03-17 Category: Standard Accept?

End Date/Time: 2023-03-17 Moisture Status:  Complete?

Result: 475.0000 Override?

Comments:

Replicate #	Seeds	Weight	Weight Per 100
1	100	0.207	0.207
2	100	0.217	0.217
3	100	0.210	0.210
4	100	0.203	0.203
5	100	0.206	0.206
6	100	0.215	0.215
7	100	0.211	0.211
8	100	0.216	0.216

Std Dev: 0.006197698

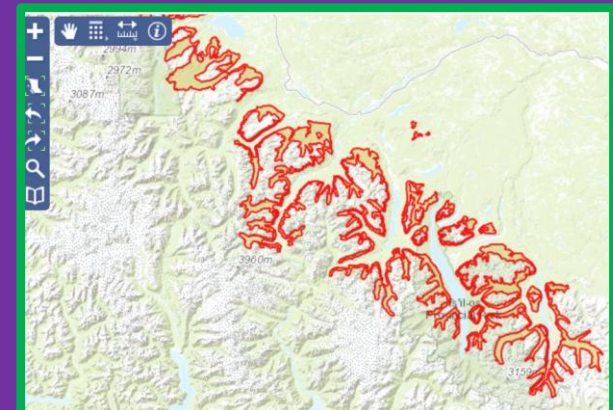
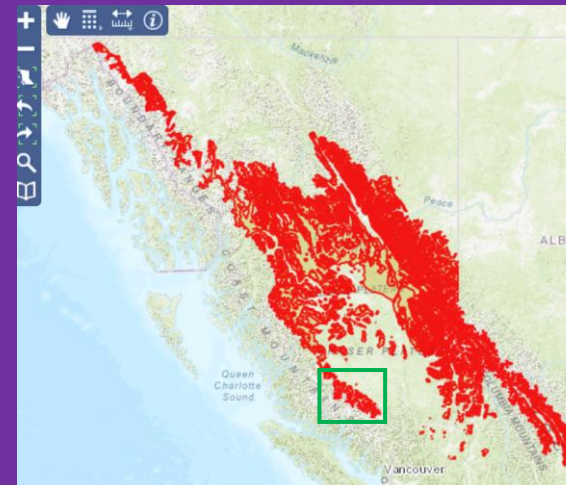
Variance: 0.0000384109

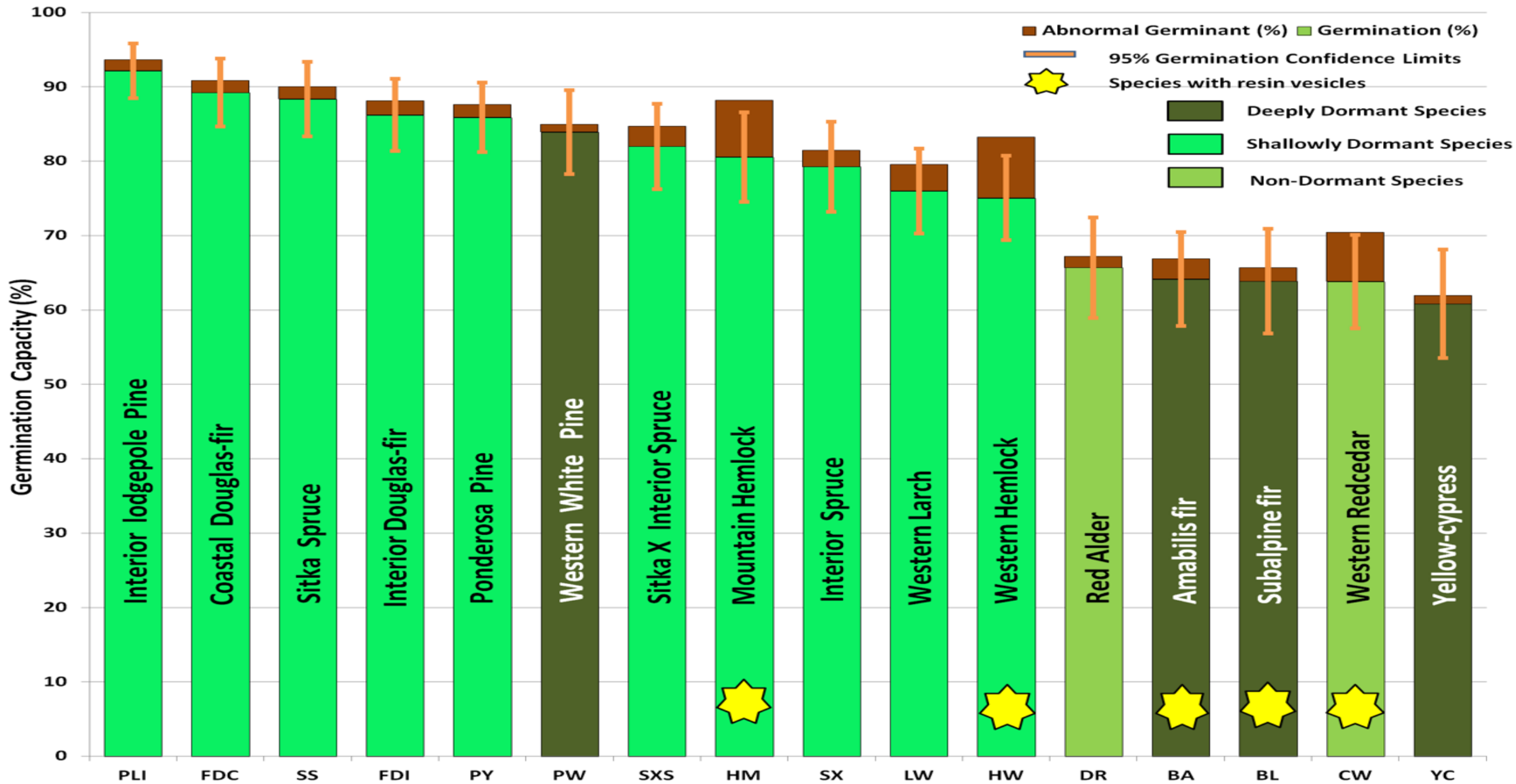
Coefficient of Variation: 2.963013848

Parity %: 99.9

Weight per 100: 475

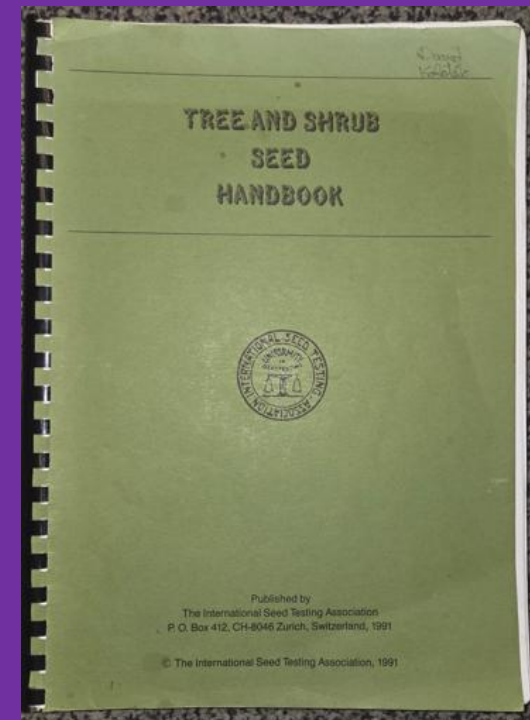
Seeds/Gram: 475





# FTS History

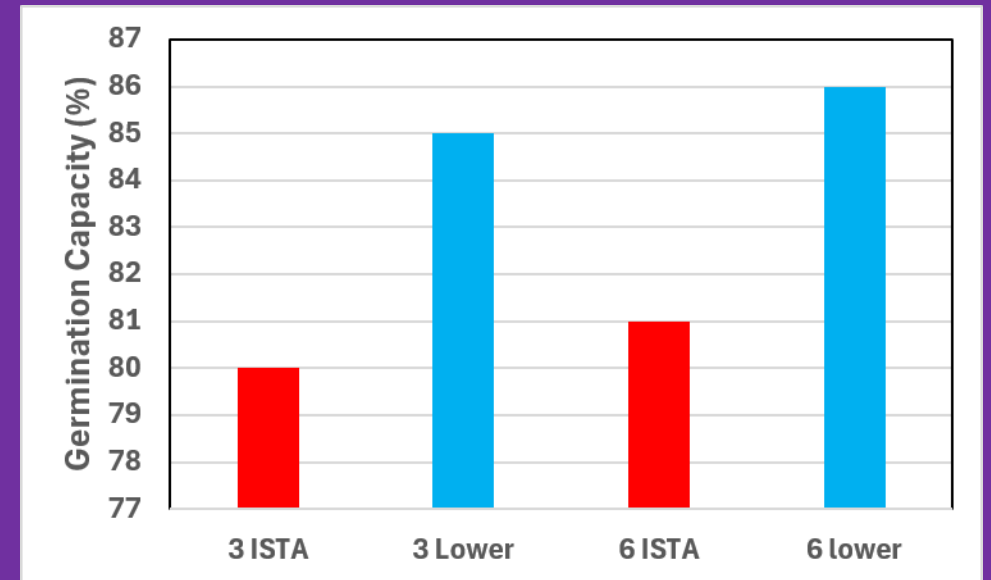
- DK Joined FTS in 2001 – Stephanie Kramer & Heidi Røsok Bye already on FTS
- Revision of the ISTA Tree and Shrub Seed Handbook on agenda then
- **Most FTS members represent non-ISTA accredited facilities**
  - Fees, Rules restrictions, a different & smaller business model than agricultural seed
  - Mixture of wild and early breeding programs (1-4 generations) for seed acquisition
  - Large genetic variability relative to agricultural species; Agricultural seed science education
- Tree and Shrub Seed Handbook (1991) revision
- On committee workplan since 2002
- E-handbook of Seed Testing and Nursery Practices (w/ OECD)
  - **Mistake** – stick with testing ! / seedling production methods too variable
  - TZ information and PSD's well populated
  - Abnormal photo documentation is common need / some included
  - Task reduced to more common genera / info needs for rarer species



- **Houdini committee** – don't really control anything in the ISTA Rules
- Partner with another committee or they reject/accept FTS recommendations
- **2017 Pure Seed Definition fiasco** w/ George Edwards (initiated in 2004 !)
- Deal with “pieces of seed units larger than one half their original size” regarded as pure seed ?
- Recommend Broken seeds be regarded as inert matter
- Decorticated seed be regarded as inert matter
- Rejection of common-sense changes – loss of credibility among tree seed testing labs

# My biggest Embarrassment

- Trusting ISTA contention of optimal germination temperatures in rules
- The 30: 20 regime doesn't relate to natural or production environment
  - Labs on FTS committee generally do not test at such high temperatures
  - For some *Picea* seedlots the maximum annual temperature is 22 C
  - Current temperature regime is detrimental for some species or seedlots
- Testing both 3 and 6 weeks stratification with ISTA (30:20) and lower (25:20) temperatures
- 8 *Picea glauca* seedlots
- Regardless of stratification duration the lower temperature resulted in 5% germination gain
- We will continue to test additional seedlots



# BC Perspective on Testing Priorities

1. Temperature regime adjustments to improve seed use efficiency
2. Photo documentation of abnormal germinants and not solely the most common types
3. Incorporation or Testing of BC stratification treatments for deeply dormant species – Is it worth it? Who really cares?
4. Provision of confidence limits around germination test results  
This can impact seed use decisions – integrate into our systems
5. Calibration curves for eRH / Aw and moisture content  
Don't want destroy seed – but target MC for stratification

