

Interior
breeding
update:
spruce,
Douglas-fir,
western larch.

Trevor Doerksen



Staff changes!!

Retired: Bonnie Hooge (2019)
(technician at PGTIS)



Hired: ???? (2020)
(technician moved to Kalamalka)



Western larch

(short-term)

- 2nd-cycle progeny tests
 - future source of forward selections
 - planted in 2016/2017 – hot, dry years!
 - poor survival on some sites.
- Nelson
 - 3-year measurements (2019)
- EK
 - 3-year measurements (2020)

Western larch

(long-term)

- new forward selections of USA material, tested in BC, grafted & planted at Kalamalka
 - top 40 individuals, 1/family.
 - top 60 individuals, ~2 per provenance.
- will cross into BC material
 - genetic variation for growth & adaptation.



Interior spruce (short/mid-term)

- artificially-infested, weevil screening
- 2019
 - families from Nelson SO
 - raised bed trial (Kal)
 - low incidence of infestation (~13%)
 - overwinter problems?
 - sister test will be naturally-infested (Barnes Creek)
- 2020
 - families from Bulkley Valley SO
 - two locations: Raised-bed (Kal), field trial (Barnes)
- stress collection of weevil attack data in regular field-based progeny tests
- NOTE: seed orchards with <90% (?) of clones, will not have R-values in SPAR





Interior spruce

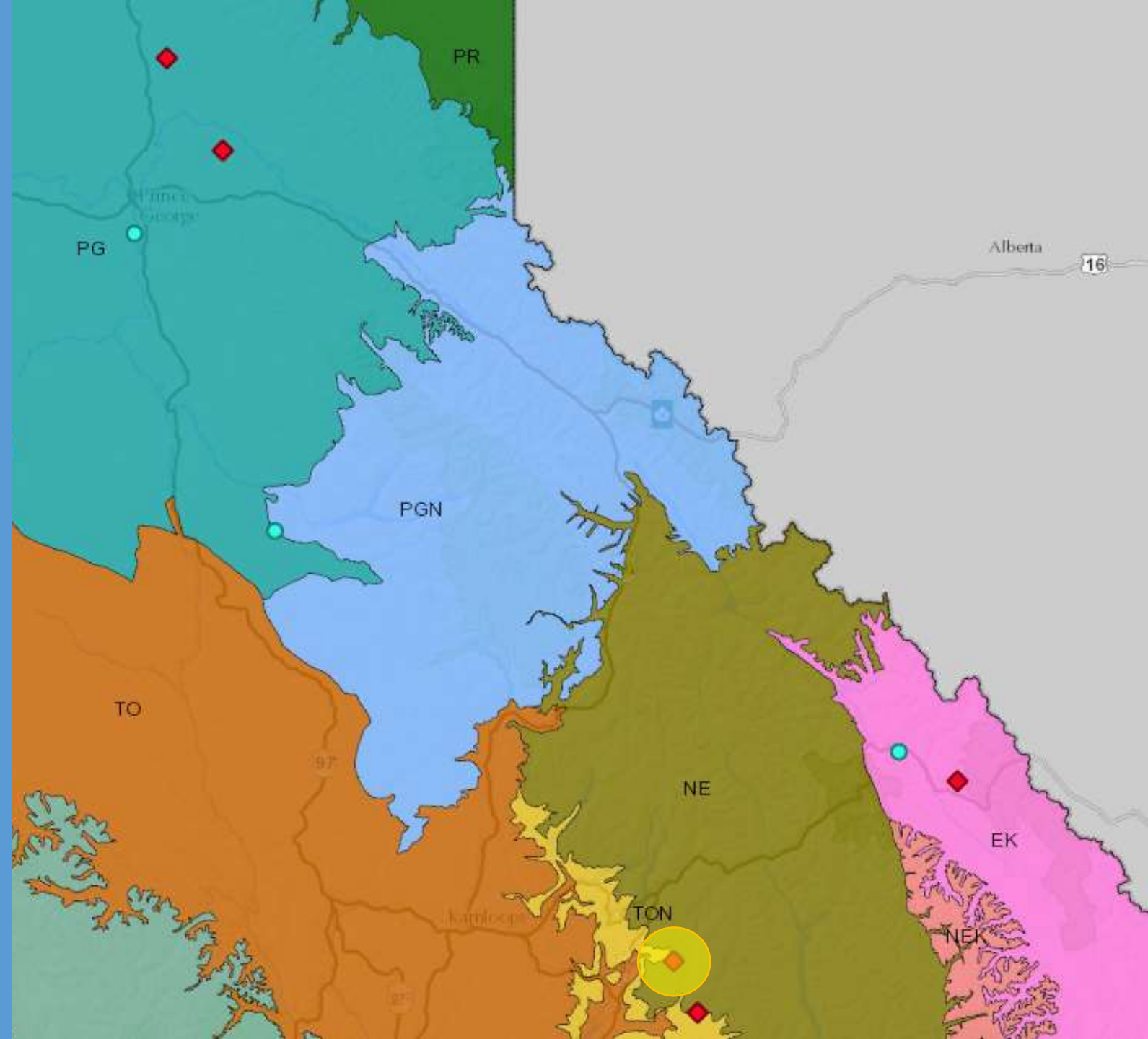
(short-term)

2nd-cycle progeny tests for Nelson breeding pops

- NOTE: source for forward selections at age 10-15.
- 2019
 - Sx NE low
 - planted 4 2nd-cycle progeny tests
 - Sx NE mid
 - sowed/lifted 5 2nd-cycle progeny tests
- 2020
 - Sx NE mid
 - plant 5 2nd-cycle progeny tests

Interior spruce (short-term)

- NE 2nd-cycle test locations.
 - NE low, 4 sites (blue) - 2019
 - NE mid, 5 sites (red) - 2020
- planted both within & outside geographic zone.
- 1 trial from each series in high weevil-hazard area (Barnes Creek, yellow circle).
 - will get back naturally-infested weevil attack info at measurement ages (6, 10).



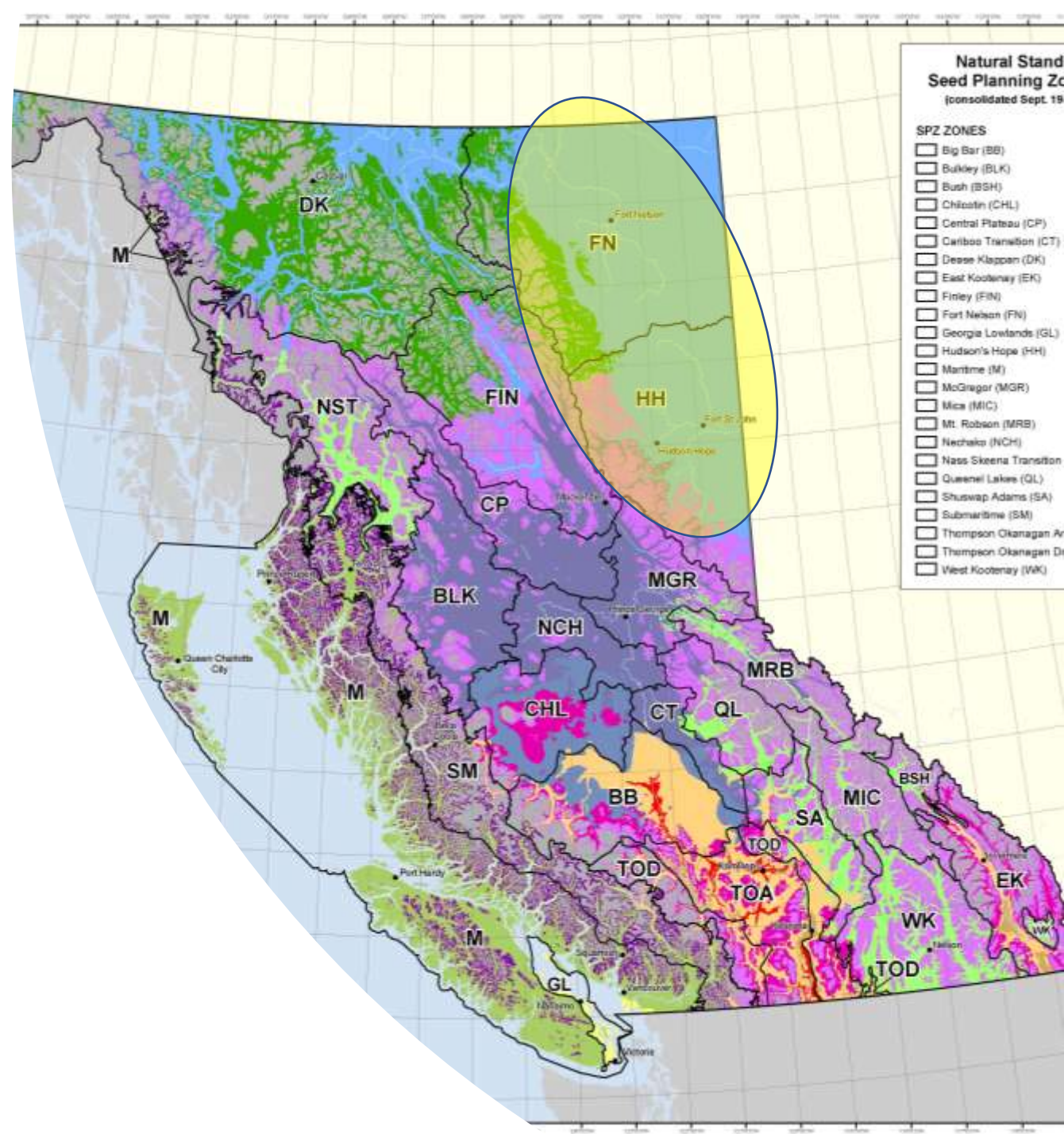


Interior spruce (long/short-term)

- Prince George (2 series), Bulkley Valley, EK all have forward selections grafted at Kalamalka:
 - TODO:
 - collect pollen (future crosses)
 - breeding strategy simulation
 - new mating design
 - FWDSEL moving to seed orchards (2020)
 - PG (VSOC)
 - BV (FLNRO-Skimikin)
 - FWDSEL clones backed up at Barnes Creek (2020), instead of PGTIS.

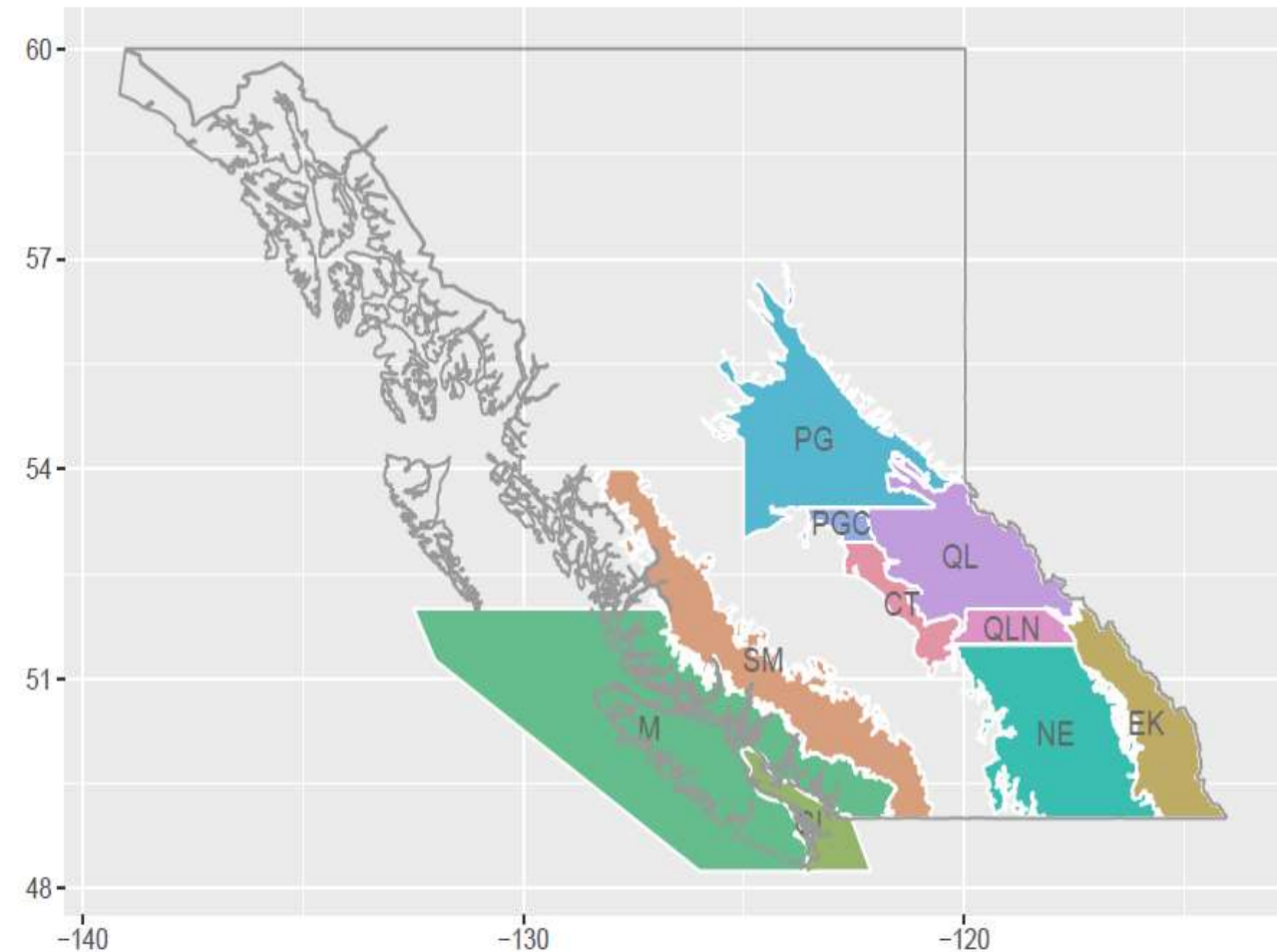
Interior spruce (mid/long-term)

- Peace River
 - Fort Nelson (FN, low 250-650m):
 - continue/expand mating design.
 - need pollen from Alberta.
 - Hudson Hope (HH, mid 650-1200m):
 - no current mating design
 - complete testing in 2 trials, partial testing in another 8 (?) trials in BC
 - partial testing in X trials in Alberta
 - TODO:
 - data share with Alberta
 - combine with BC data, MET analysis
 - backwards/forward selections, mating design



Interior Douglas-fir

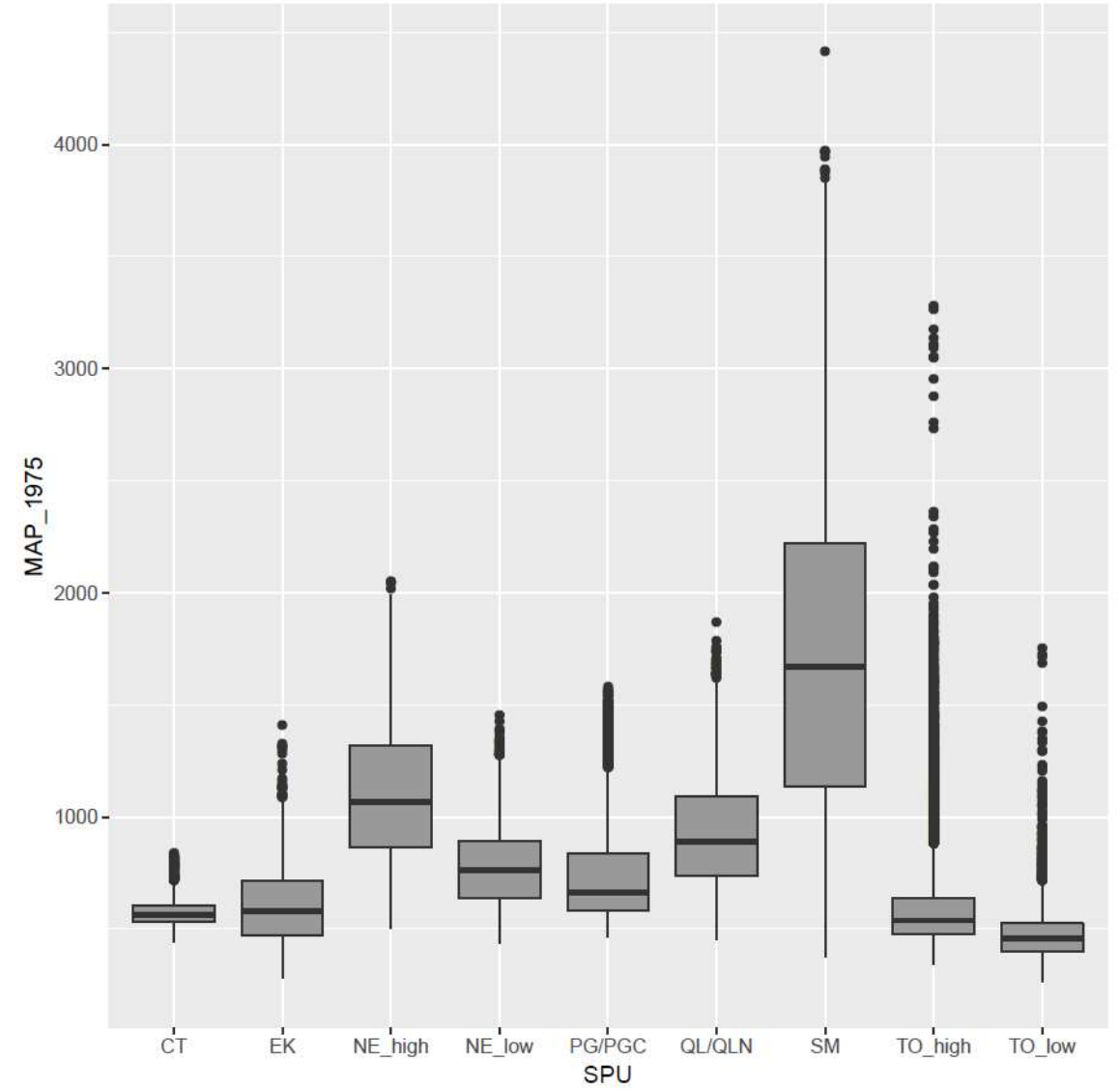
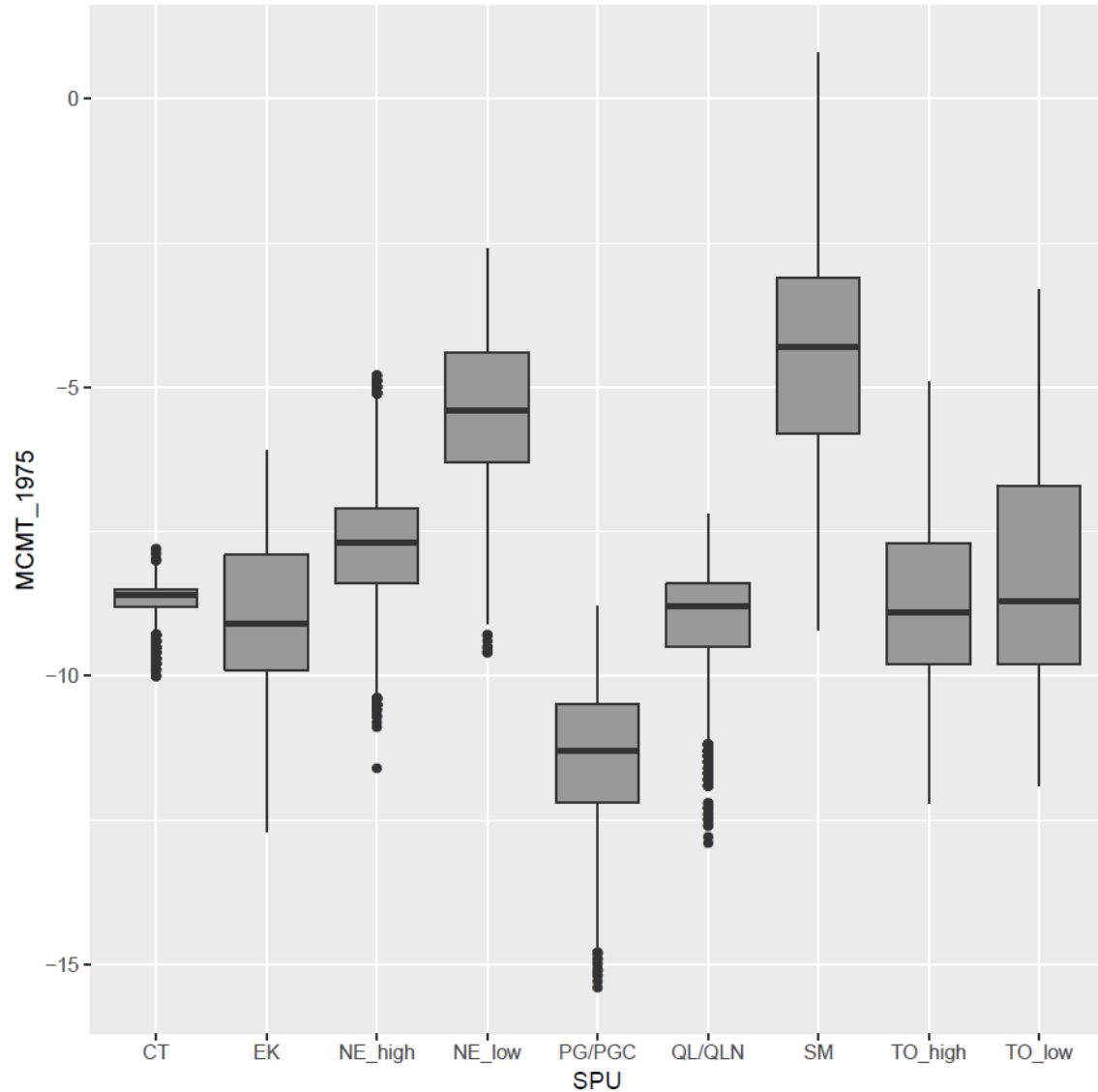
(short-term)



- 2019 project
 - database all progeny test records (done). Thanks Jong Leong.
 - How many progeny tested?
- 2020 project
 - large MET analysis. Use to:
 - standardize breeding values across geographic zones.
 - BVs comparable between orchards.
 - predict breeding values into zones where no progeny testing, eg TO.
 - delineate deployment zones?

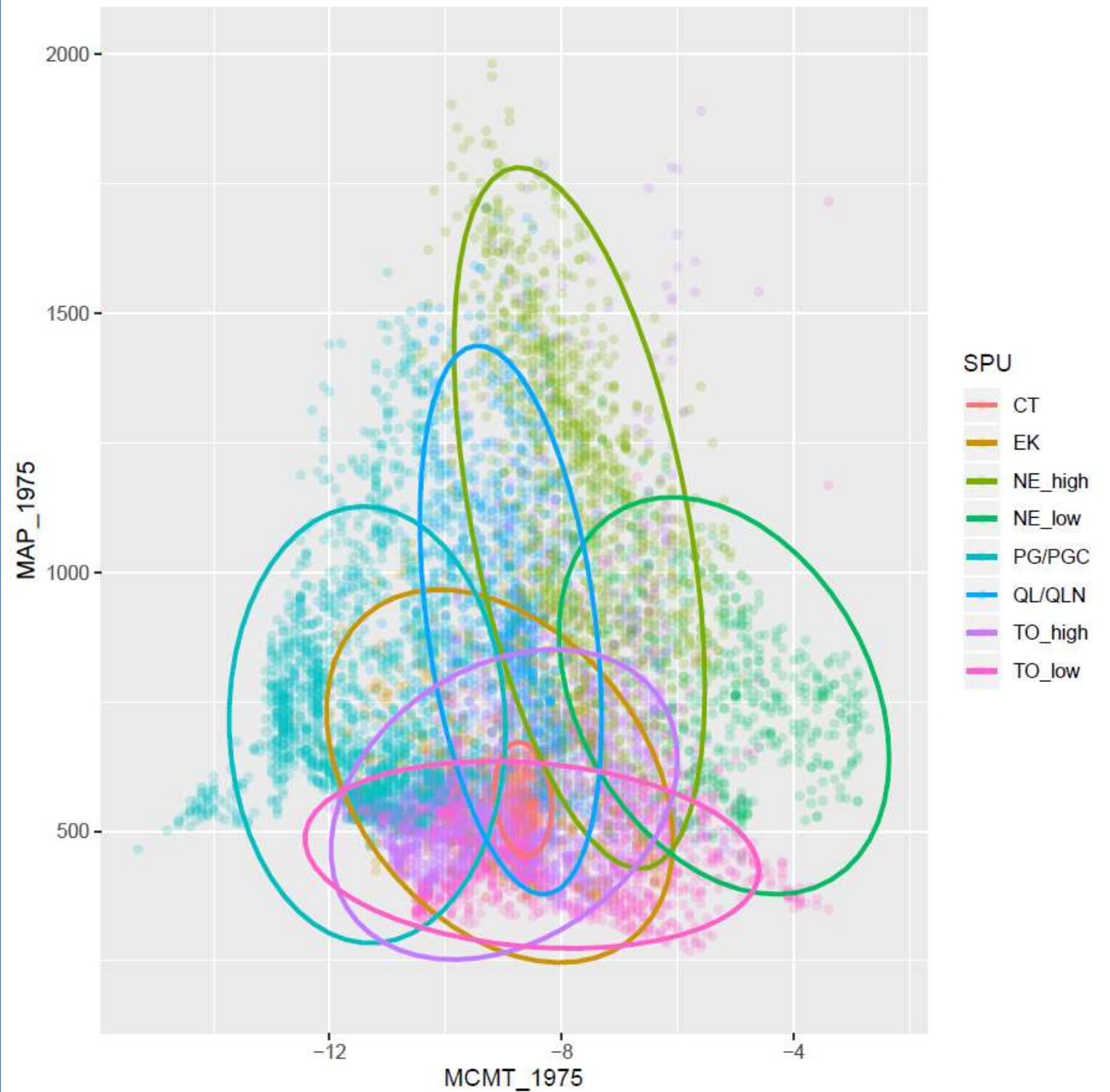
Interior Douglas-fir

climate by SPU



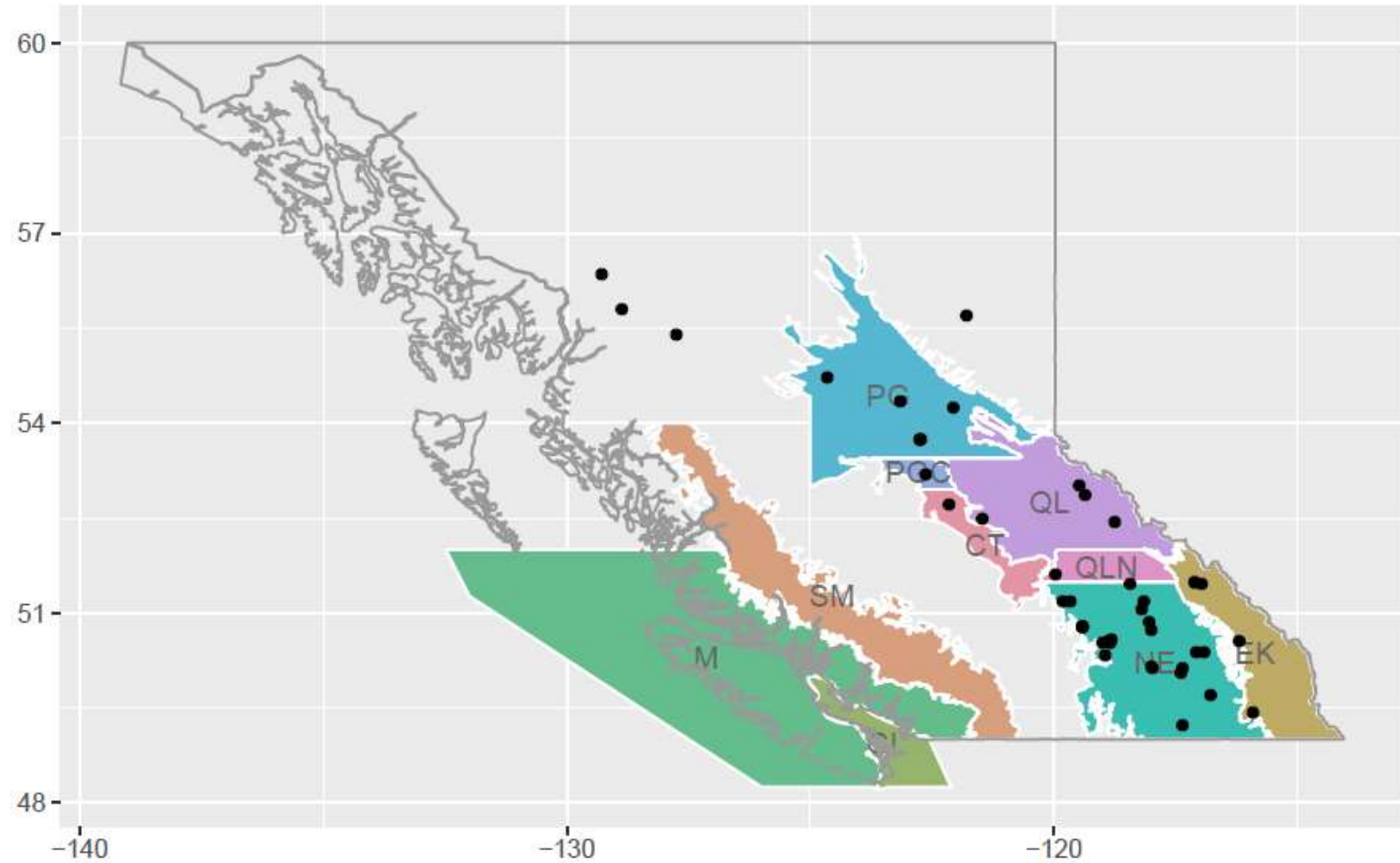
Climate by Fdi SPU

Precipitation (MAP) vs
temperature (MCMT)



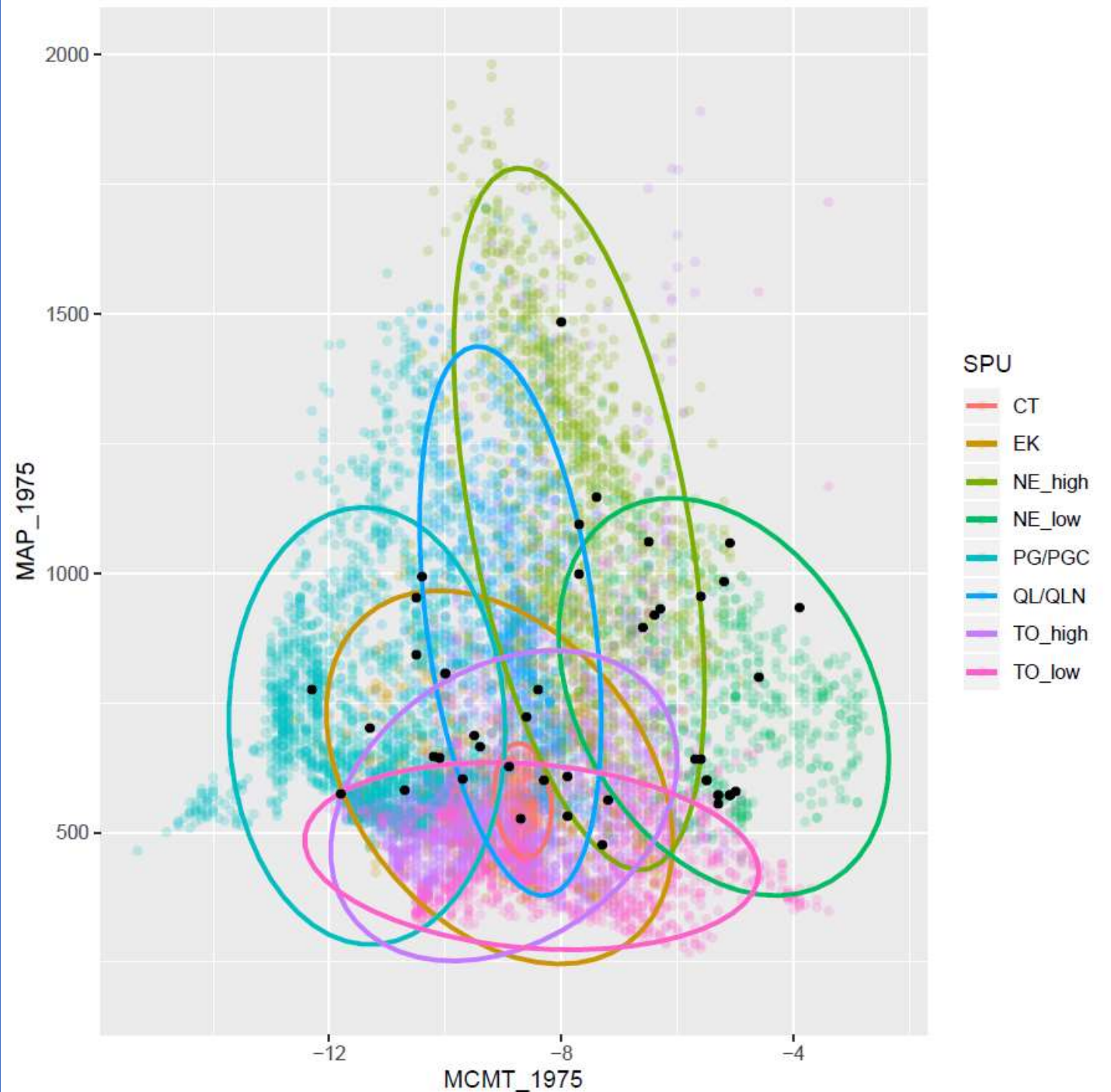
Interior Douglas-fir

Progeny test location – SPZ overlay



Climate by Fdi SPU

Precipitation (MAP) vs
temperature (MCMT)
...with progeny test site
climates.



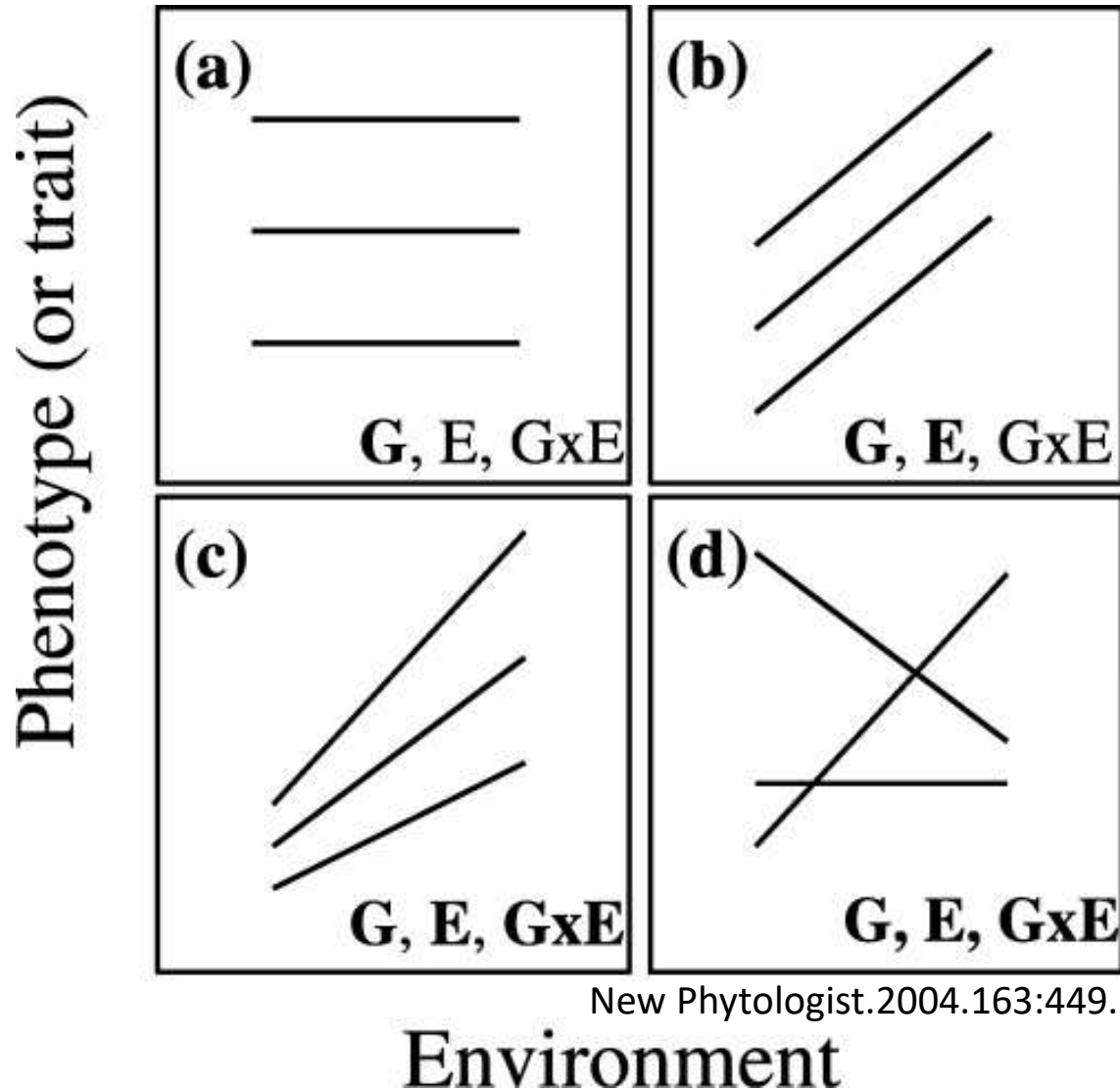
Interior Douglas-fir: 2nd-cycle testing

(short/medium-term)

Breeding pop	Testing env	Deploy	SM	NE low elite	NE high	QL	CT	CP	EK	NE low midR	checks
NE low elite, SM	Warm, dry		15	160	20					20	5
NE high, QL	Moderate, wet		15	20	100	100				20	5
QL, CT, (TO)	Moderate, dry				25	150	50	25			5
CP, CT, EK, (TO)	Cold, dry						100	100	50		5
NE low midR	Warm, dry			25	25					200	
sampled crosses				160	100	250	100	96	40		
Total crosses				200	125	250	125	128	50		
Parents (Ne)				80	50	100	50	64	20		

Interior Douglas-fir: 2nd-cycle testing

(short/medium-term)



New Phytologist.2004.163:449.

- Reminder about genetic testing & evaluation:
 - Goal is to select for generalists.
 - no/little GxE (crossover) within deployment zone.
- Do we need to test in “orphan BECs”?
 - No. Performance responsive & stable over (all) environments.
 - Yes. Why not as we enter a testing phase?
 - Easy to establish a satellite trial.



Interior Douglas-fir (medium-term)

Wood quality

- collect acoustic velocity measures in 1st-cycle tests
 - surrogate for wood quality (fibre angle)
 - 1 trial/series, ~30-years old.
 - use to help improve precision of wood quality predictions, in younger (age 10-15), 2nd-cycle full-sib tests.
 - NOTE: testing age-age genetic correlations for AV in spruce.
- wood milling study (see next or Nick's presentation!). Make link between:
 - 1) non-destructive measures and
 - 2) wood strength & value.

Wood quality

milling study (lodgepole 2019)

- sampled ~360 trees in 1st-cycle progeny test (age 30)
- non-destructive measures
 - acoustic velocity & emission
 - wood density (cores), on related trees
 - growth traits (ht, dbh)
 - $MOE = v^2 \cdot \rho$
- shipped 1st, 3m log(s) to UBC
 - Centre for Advanced Wood Processing (Julie Cool, Marc Banholzer)
- logs scanned, sawn (optimally)
- lumber graded
- MOE/MOR testing on lumber



**Variation of lumber properties in genetically improved full-sib families
of Douglas-fir in British Columbia, Canada**

Cosmin N. Filipescu^{1*}, Michael U. Stoehr² and Don R. Pigott³

- sampled ~360 trees in 1st-cycle progeny test (age 30)
- non-destructive measures
 - acoustic velocity & emission
 - wood density (cores), on related trees
 - growth traits (ht, dbh)
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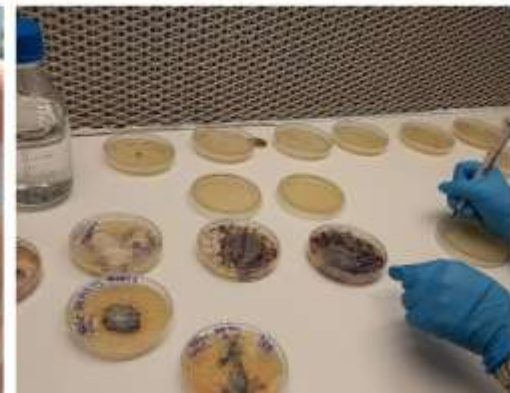


Interior Douglas-fir

(short/medium-term)

Armillaria ostoyae screening

- collected & isolated a dozen strains of A.o.
- archived & actively culturing the strains.
- cultured select strains on different substrates as inoculum source
 - birch stems
 - birch dowels, with MEA.
- inoculated known R & S families, in attempt to replicate results.
- establish an A.o. field-based screening garden. Inoculate in GH, then move to field to express disease, to take pressure off greenhouses.



Summary of major projects - 2020.

species	activity	sub-breeding pop	purpose
western larch	3-year M&M	EK, 2 nd -cycle	forward selections
interior spruce	plant progeny tests	NE mid, 2 nd -cycle	forward selections
	plant weevil screening trial	BV, 1 st -cycle	IWS values, cull orchard clones
	crossing (staff)	FN (HH), 2 nd -cycle (PG, BV, EK, 3 rd -cycle)	forward selections
Douglas-fir	grow seedlings	NE high, QL, 2 nd -cycle	forward selections
	site preparation	NE high, QL, 2 nd -cycle	forward selections
	crossing (staff)	ALL	
	AV measures (milling study)	CP (NE low)	inform early selection for non-destructive WQ measures
Barnes Creek	clone bank maintenance	all	clonal archive

Kalamalka Staff 2020.

Trish, Nancy, Mark, Denielle, Kyla, Jarrett

Lindsay, Mikayla, Tiffany, Katelyn, Val, Rachel

Missing: Sarina, Heidi, Amy, Kyle, Sue, Barry.

