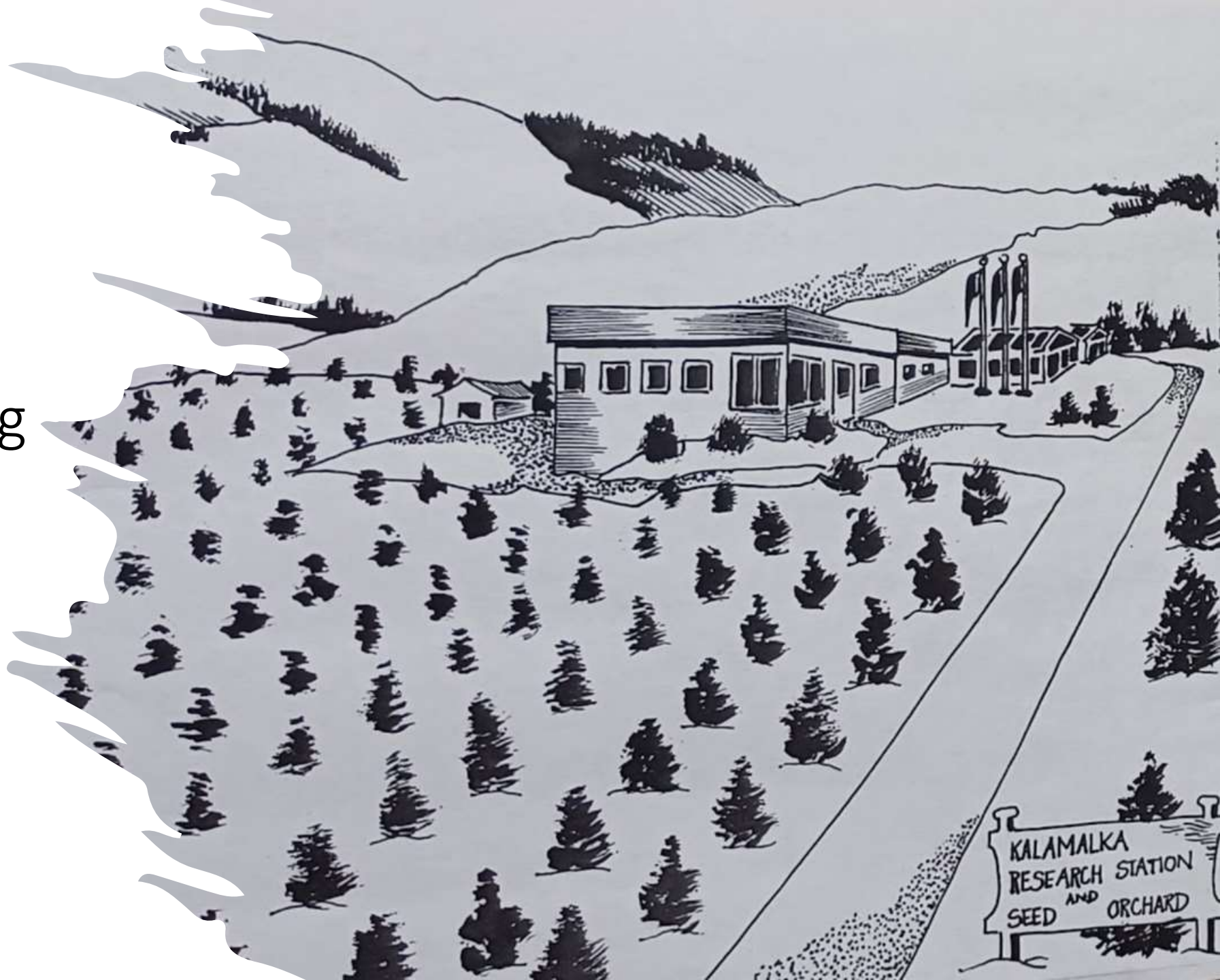


Interior breeding
update (2024):
interior spruce,
Douglas-fir,
western larch

Trevor Doerksen





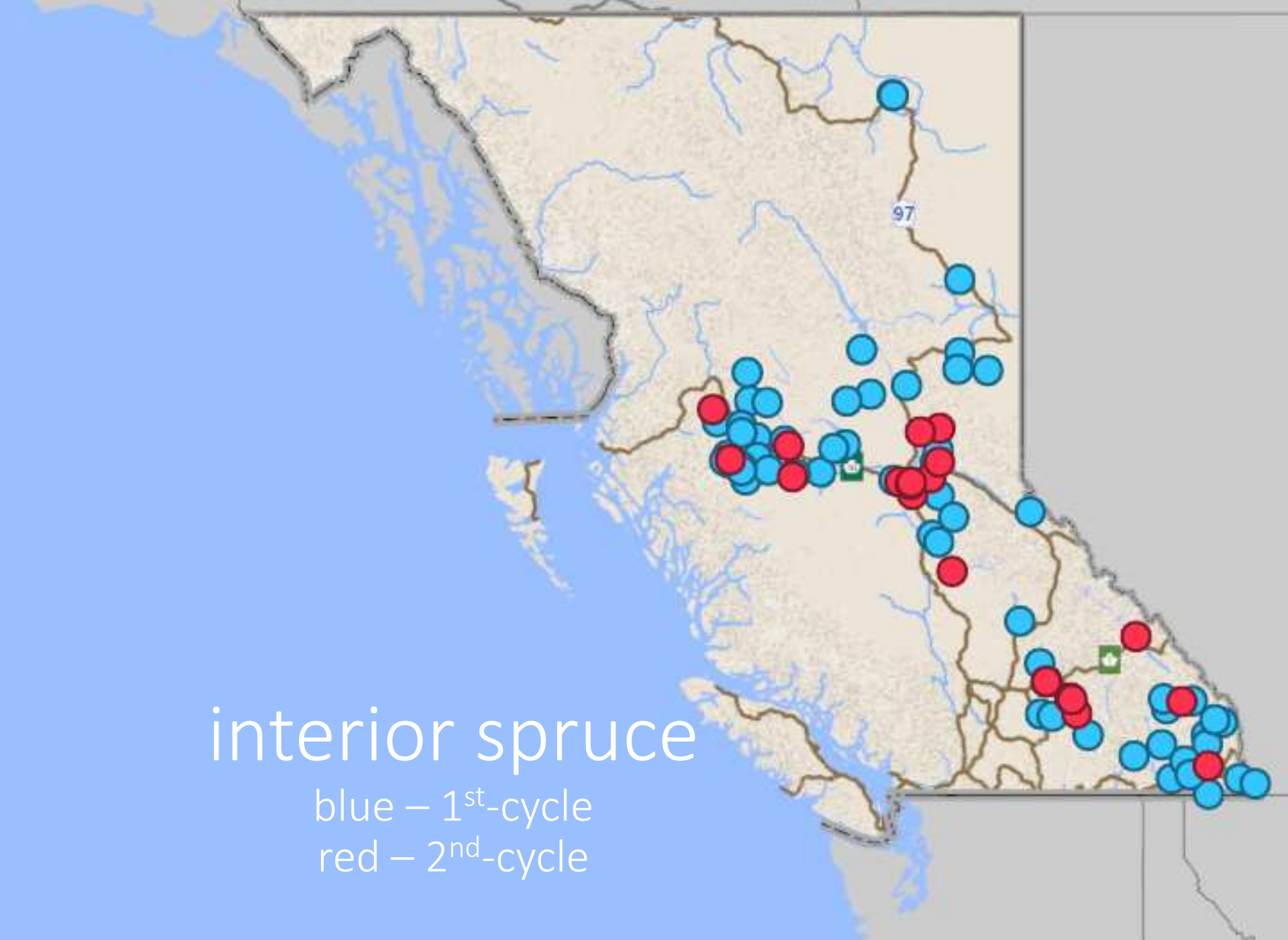
interior spruce structure

- 1st-cycle testing (OP families)
 - ~4200+ base parents (some ENA, AB)
 - 9 pops (11 SPU), 17(?) series, 70 trials
 - NOTE: populations still use GBST names after SPZ/U!
- 2nd-cycle testing (controlled crosses)
 - 7 pops, 7 series, 23 trials (see later)
 - NOTE: no 2nd-cycle yet in Peace River (see later)
- crossing started for 3rd-cycle trials: PG, BV, EK
- **db of current & historical records built! ~700,000+ trees!**
Use all data for multi-environment trial (MET) analysis to:
 - delineate deployment zones, based on GEI patterns
 - (re)allocate parents to zones/orchards
 - decide which orchards to rebuild (species meeting?!)
- **traits to evaluate: growth, wood quality, weevil resistance**

interior spruce

blue – 1st-cycle

red – 2nd-cycle





Interior spruce crossing

- 2nd-cycle Peace River (FN) crossing near completion
 - supplement future testing with OP seed from AB (region G1, I).
 - also seed from MB, MN, ON.
 - NOTE: received data from AB to aid in genetic predictions across the region
 - Anyone from the Peace interested in finding blocks for trials in the next few years?
- 3rd-cycle mating (PG, EK, BV)
 - mostly forward & some 'missed' backwards selections.
 - algorithmically designed to optimize genetic gain & maintain diversity





Interior spruce

2nd-cycle testing

- 11 southern progeny trials, all connected
 - 4 Nelson low (2019), 6-yr M&M in 2024
 - 5 Nelson mid (2020), 3-yr M&M in 2022
 - 2 Thompson-Okanagan (2014), 10-yr M&M in 2023, combine with:
 - TO 1st-cycle data
 - NEL (SA) 1st-cycle data
 - → candidate forward selections, fall 2024-winter 2025.
 - Good weevil pressure in one trial (Skimikin) → evaluate for resistance. (see next)
- NOTE: will analyze and (hopefully!) make forward selections to rebuild TO pop, HOWEVER will need to combine TO & NE trial data to determine joint deployment & orchard design.



Interior spruce weevil resistance

- artificial infestation (augmentation) screening trials were meant to validate field observations
 - disappointing results for amount of effort
- instead, refocus on natural infestation in high hazard field-based trials and validate:
 - against other connected field-based trials with weevil attacks
 - by characterizing the best vs worst putatively resistant genotypes
 - e.g. structural, chemical ecology (see Sebastian)





Breeding arboretum turnover!

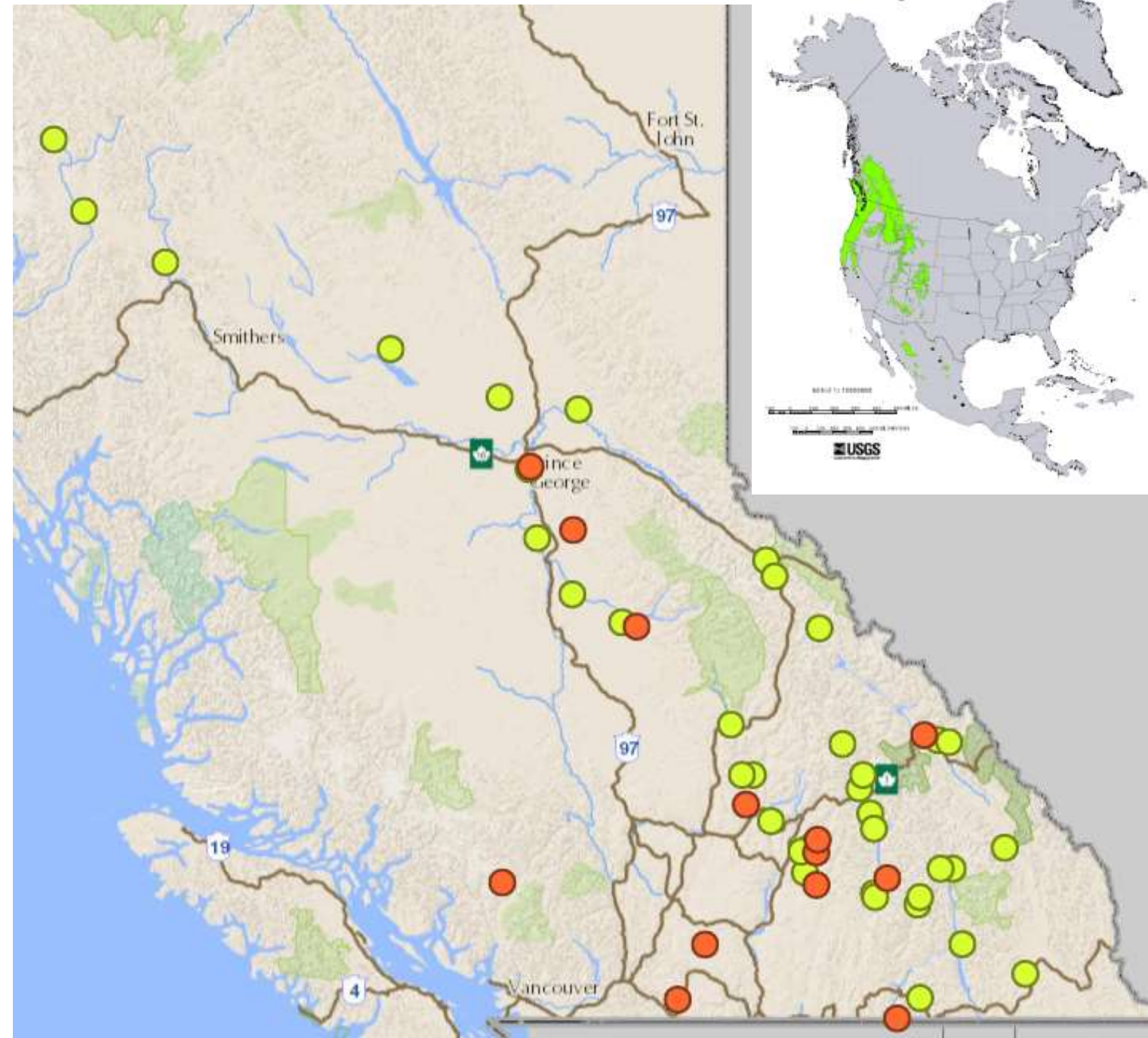


interior Douglas-fir structure

- 1st-cycle (OP families)
 - ~1700 interior base parents (+200 SM & coastal)
 - 6 pops (8 SPU), 11 series, 48 good trials (39 env), good connections
- 2nd-cycle (controlled crosses)
 - ~436 parents, 6 pops, 3 series, 13 trials, all connected
- PECULIARITIES :
 - Thompson-Okanagan (low, high SPU)
 - no base parents, no trials
 - 2nd-cycle trials in some of these environments (e.g. IDFd-)
- traits to evaluate: growth, wood quality, *Armillaria* resistance

interior Douglas-fir

- yellow – 1st-cycle
- orange – 2nd-cycle
- Collaborating with Australian scientists (Smith & Cullis) to publish an MET-approach to deployment
 - based on GEI patterns.



Interior Douglas-fir 2nd-cycle testing



- 13 2nd-cycle trials established
 - 5 Nelson high & QL (2021)
 - 3-yr measure in 2023
 - 4 Nelson low (2022)
 - 3-yr measure in 2024
 - 4 Northern (2023)
 - CT, CP, EK
- all trials connected
- 1st- & 2nd-cycle trials can be combined
 - info stacks as program progresses!



Armillaria resistance (2023)

- sow 60 families CT/EK pop
- inoculate 60 families CP/EK pop
- plant 60 families QL pop
- NEH trial displaying symptoms, 1 yr in field
- NEL trial failed/terminated, hot/dry spring 2023

western larch

structure

- 1st-cycle (OP families)
 - ~600 base parents, 2 pops, 4 series
 - 14/16 good trials, all connected
- 2nd-cycle (controlled crosses)
 - ~289 parents, 2 pops, 2 series
 - 10 trials, all connected
 - establishment affected by heat/drought in 2017-2018
 - more poor trials in EK series!
- 90 additional OP forward selections from USA
 - make crosses & store -> test in 3rd-cycle.
- traits to evaluate: growth, wood quality

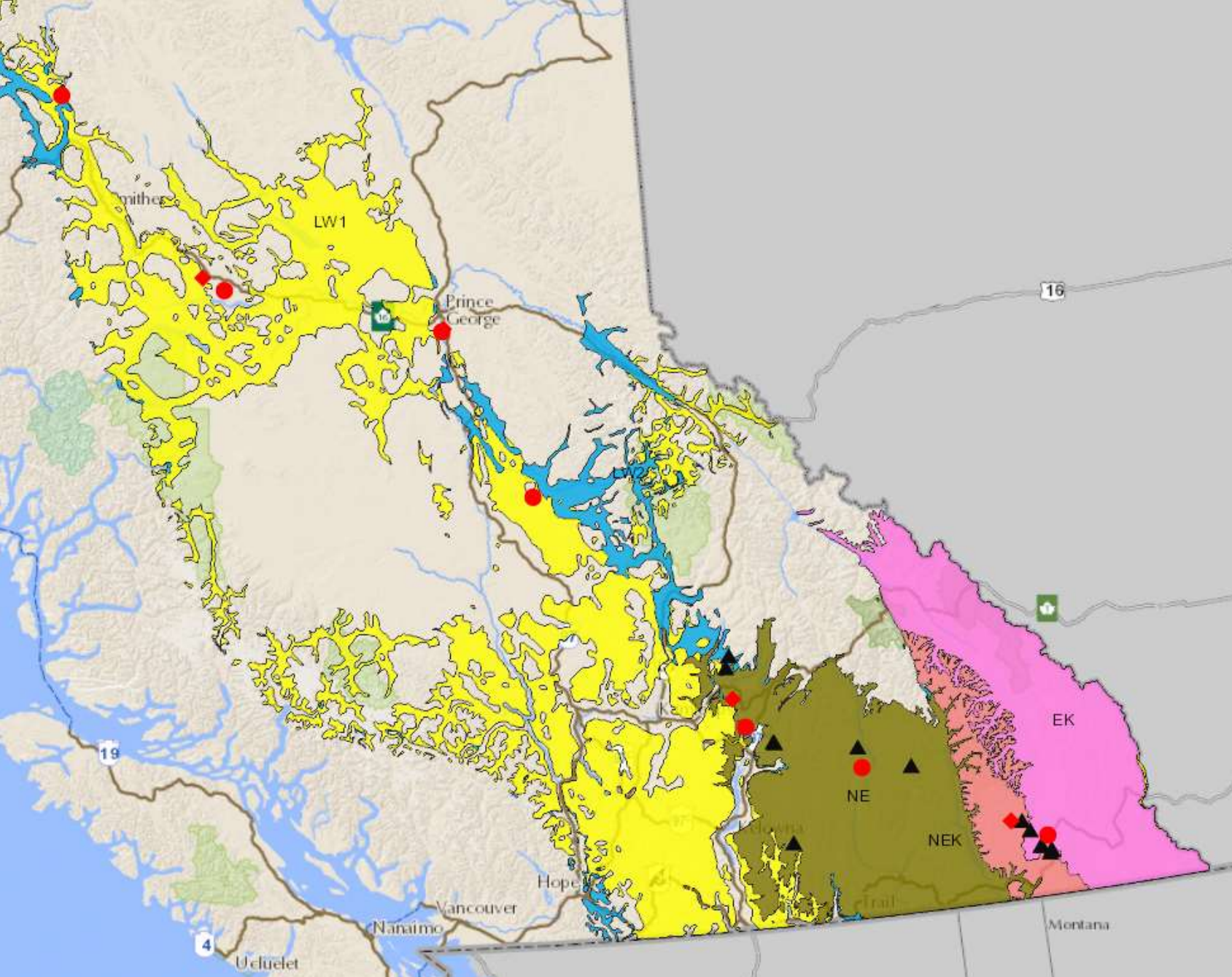


Western larch

2nd-cycle testing

- graft upkeep/maintenance
- M&M of 10 trials
 - NE (2017), 6-yr in 2022
 - **EK (2018), 6-yr in 2023**



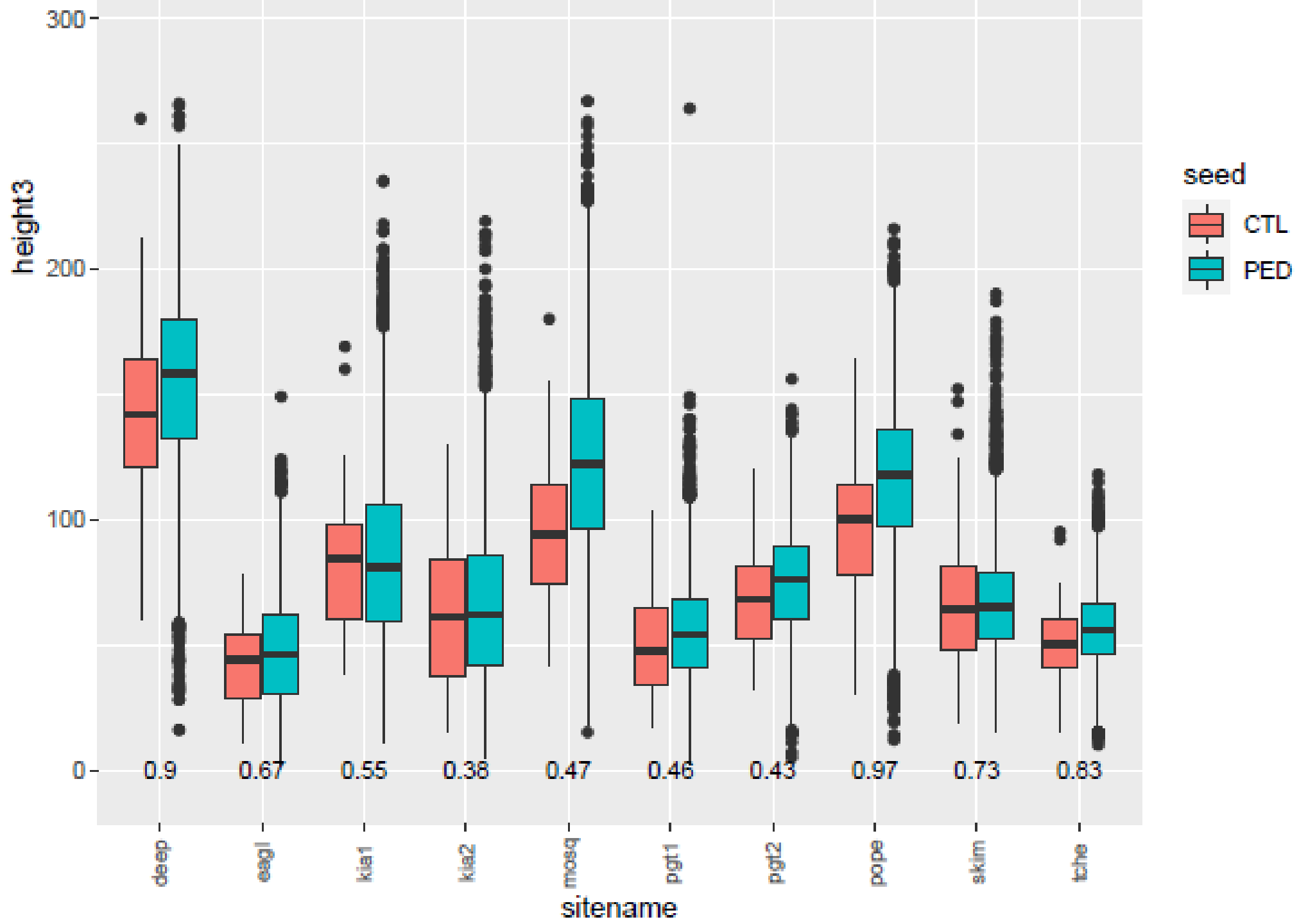


western larch

- black – 1st-cycle
- red – 2nd-cycle

Larix occidentalis





overall strategy

evaluate growth in MET (update)

- makes GVO estimates comparable. Use to:
 - delineate deployment zones
 - (re)allocate parents to zones
 - selection, GVOs in SPAR, etc.
- thinking about how to 'infuse' advanced populations with new, unrelated material (diversity)
 - missed parents in MET
 - selections from provenance trials
- QC genotyping of selection candidates, e.g. pedigree checking, diversity

evaluate wood quality in one trial/series

- threshold trait to maintain quality (no GEI)

evaluate pest resistance

- field-based in high disease hazard areas OR artificial inoculation
- characterize putative high/low resistance for disease

Summary of major projects - 2023.

species	activity	breeding pop	purpose
western larch	6-year M&M	EK	forward selections
interior spruce	10-year M&M	TO low/high, 2 nd -cycle	forward selections, **good weevil information?**
	sow field-based weevil trial (Skimikin)	BV, 1 st -cycle	forest health, IWS values, cull SO 243 & 250 clones
	crossing (staff)	PR (FN, HH), 2 nd -cycle PG, BV, EK, 3 rd -cycle	forward selections new trials
Douglas-fir	plant 4 progeny trials	North (CT, CP, EK), 2 nd -cycle	forward selections
	sow seedlings	CP (PG) / EK	forest health, Armillaria
	inoculate seedlings	QL	forest health, Armillaria
	plant inoculated seedlings	NEL	forest health, Armillaria
Barnes Creek	clone bank maintenance	all	clonal archive

Summary of major projects - 2024.

species	activity	breeding pop	purpose
western larch	clone maintenance	USA	future parents for breeding
interior spruce	6-year M&M	NE low 2 nd -cycle	forward selections
	collect scion, graft	TO low/high, 2 nd -cycle	forward selections
	AV measures	TO, 1 st -cycle	wood quality
	plant field-based weevil trial (Skimikin)	BV, 1 st -cycle	forest health, IWS values, cull SO 243 & 250 clones
	crossing (staff)	PR (FN, HH), 2 nd -cycle PG, BV, EK, 3 rd -cycle	forward selections new trials
Douglas-fir	3-yr M&M	NE low, 2 nd -cycle	forward selections
	AV measures	EK, 1 st -cycle	wood quality
	sow seedlings	CT/EK	forest health, Armillaria
	inoculate seedlings	CP/EK	forest health, Armillaria
	plant inoculated seedlings	QL	forest health, Armillaria
Barnes Creek	clone bank maintenance	all	clonal archive



Kalamalka staff 2023.

- Lindsay, Penny, Kyle, Kim, Sarina, Serena, Leslie, Elisa, Hailey, Sebastian, Greg, Fatih.

- Missing: Val, Marie, Meredith, Jenny, Linda, Nick.

