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

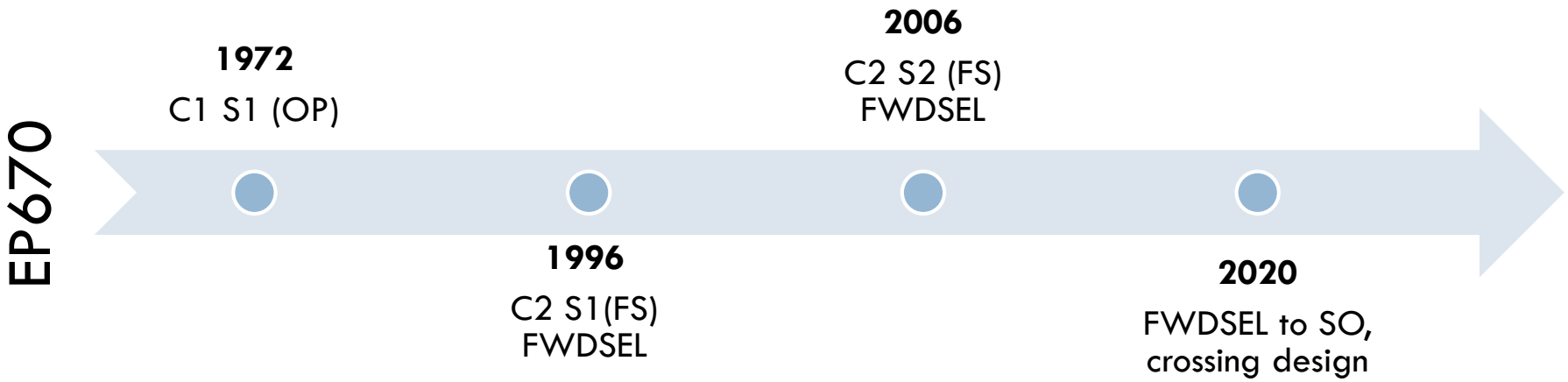
Trevor Doerksen

- Barry successfully dodged retirement for years…

- …but has now officially passed on the torch.
- 3 generations of spruce breeders!
  - long generation time of conifers
  - success of our programs depends on the previous generation!

interior spruce

- EP670, S1 (Gyula) – PR (BV), PG & EK SPZs
- EP819, S2 (Silviculture) – all other SPZs (some overlap!)



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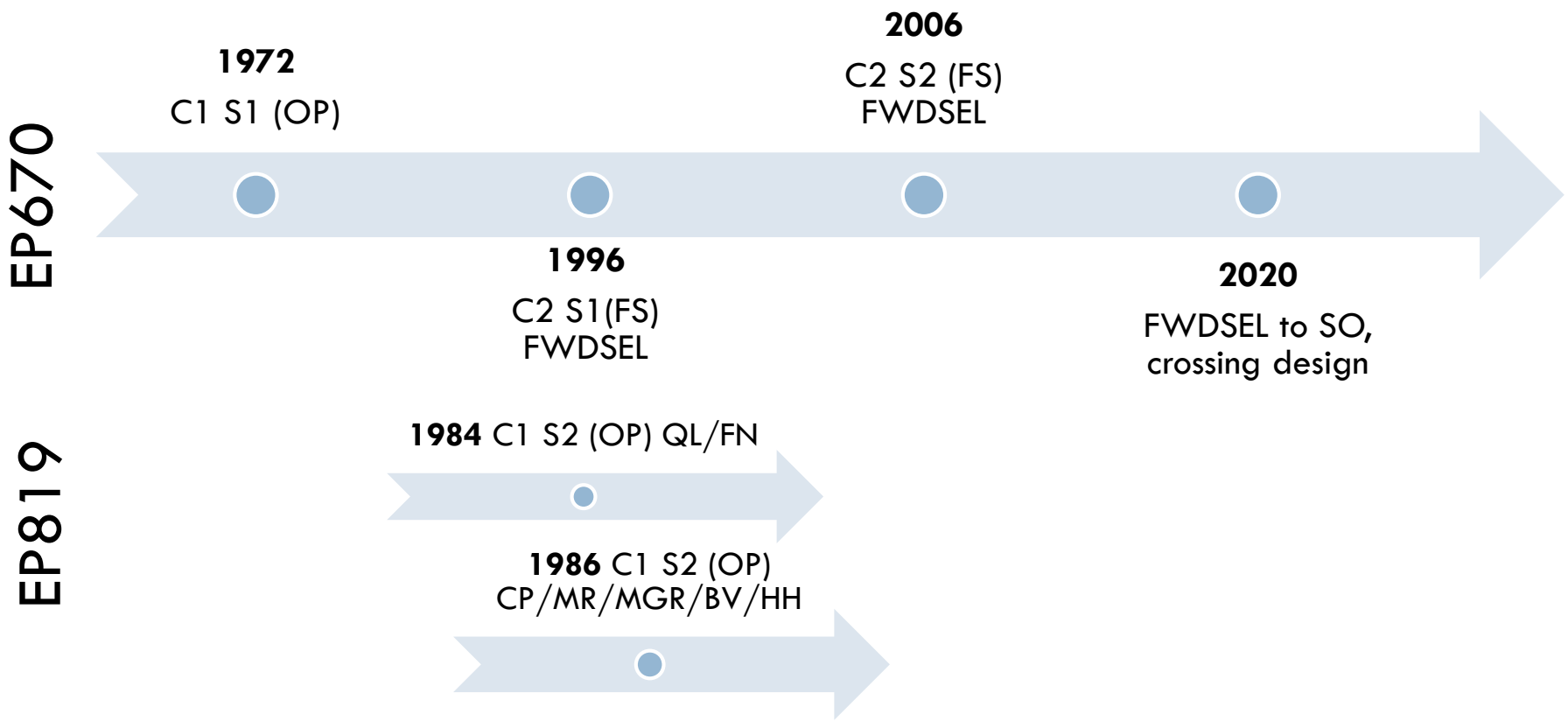

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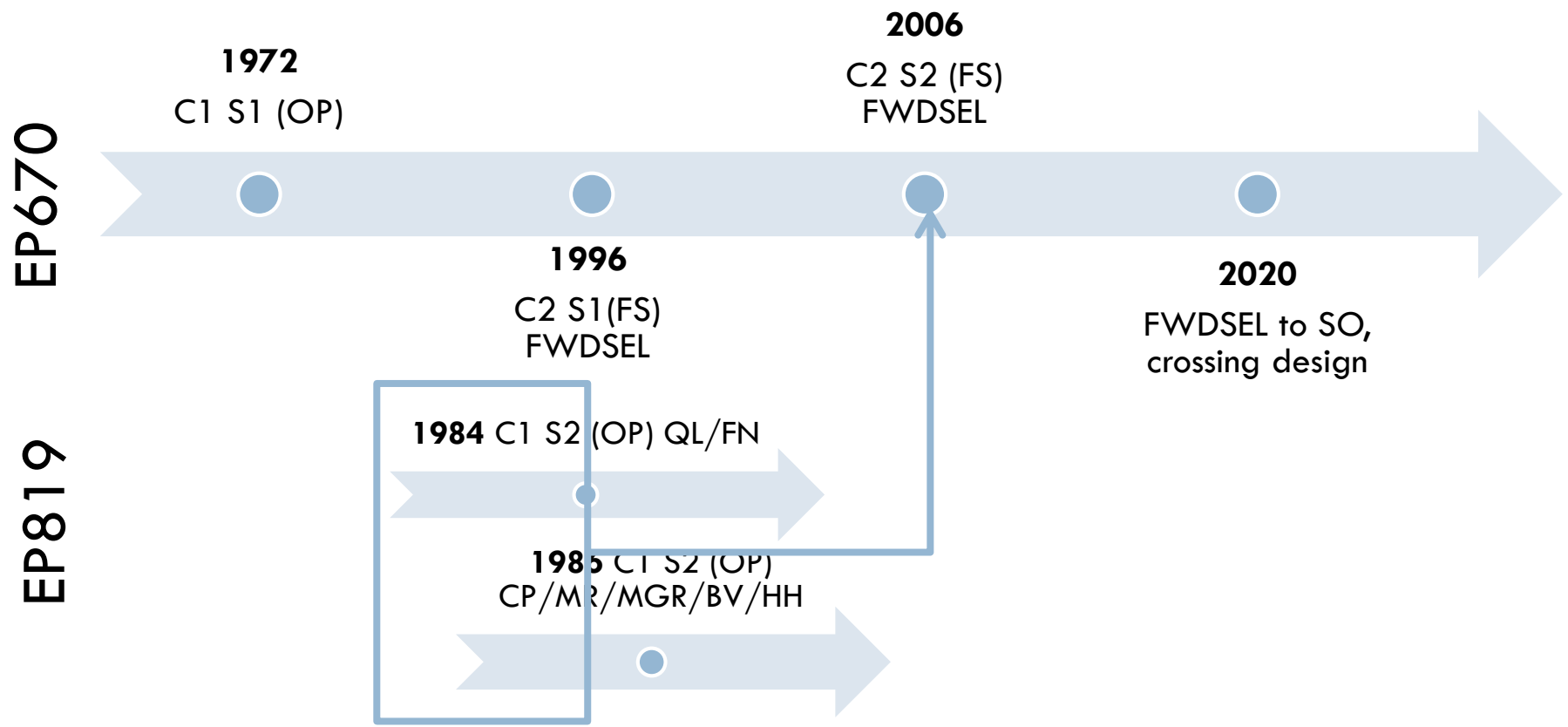

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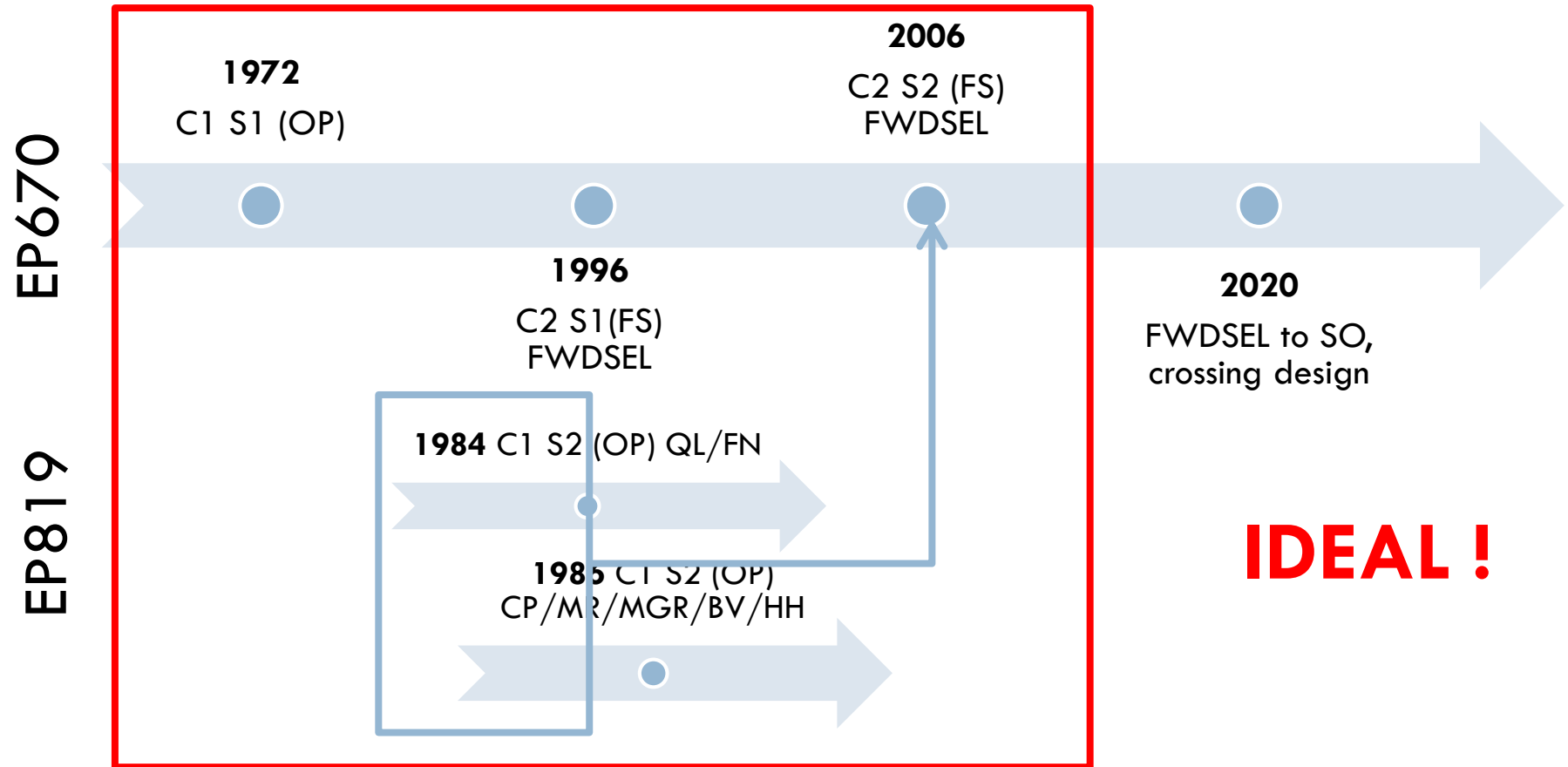

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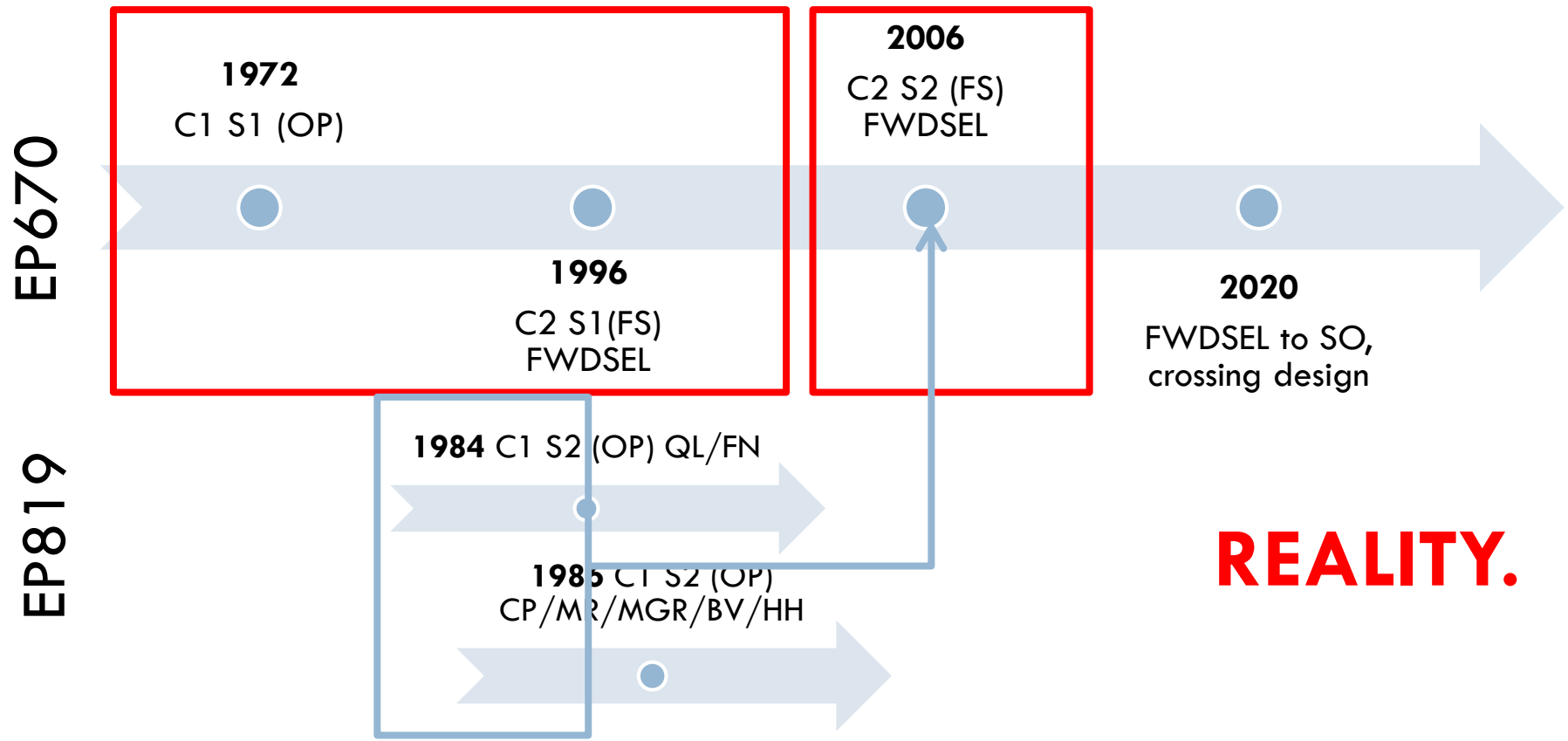


interior spruce

	BV	PG	EK
BV	127	x	x
PG		65+92	x
EK			75

- TODO (short term):
  - optimize selections for seed orchards (PG)
    - ↑ gain, ↓ relatedness
    - reanalyze series jointly? (see long term)
  - Crossing designs:
    - Fort Nelson (30%)
    - NE low – complete
      - test in 2019 (next)
    - NE mid – complete
      - sow 2019 (PRT)

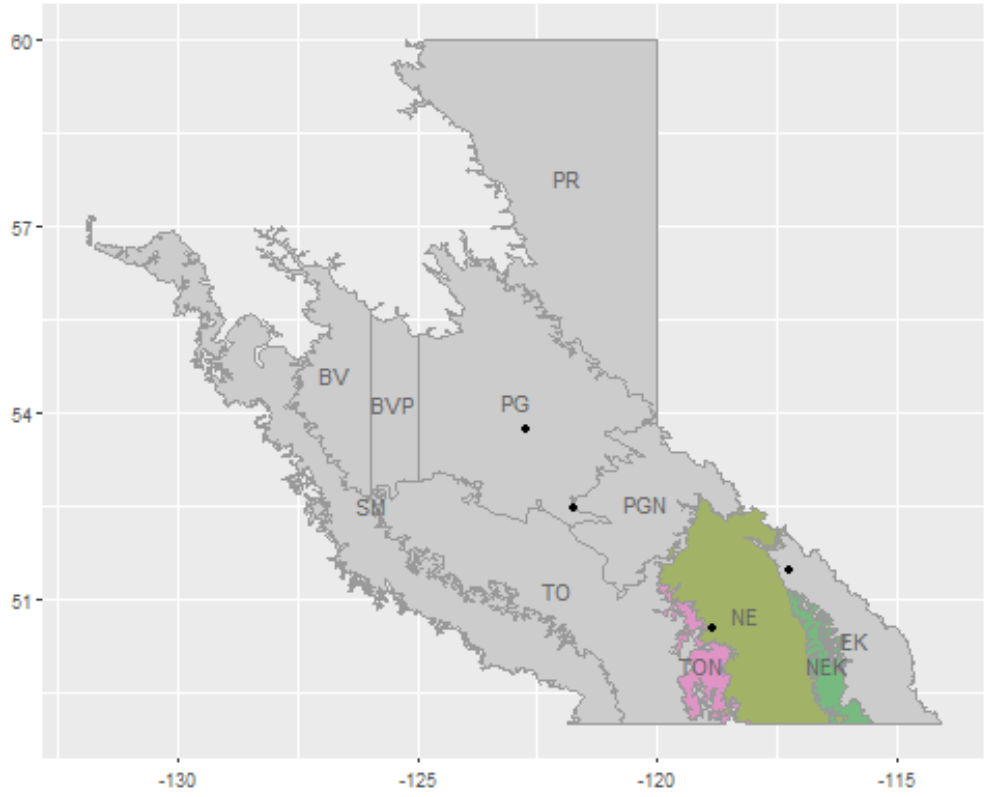
interior spruce – NE low cycle 2

- in 2018, 2nd-cycle NE low progeny tests:
  - sown

interior spruce – NE low cycle 2

- in 2018, 2nd-cycle NE low progeny tests:
  - sown
  - lifted

interior spruce – NE low cycle 2



- in 2018, 2nd-cycle NE low progeny tests:
  - sown
  - lifted
- in 2019, 4 progeny tests to be planted:
  - not limited to geographical SPZ

CBST Seedlot Selection Tool Version 1.0

Instructions | I Have A Cutblock | I Have A Seedlot

Seedlot Number:

Set Species & BEC

OR

Species:

SX

BEC Variant:

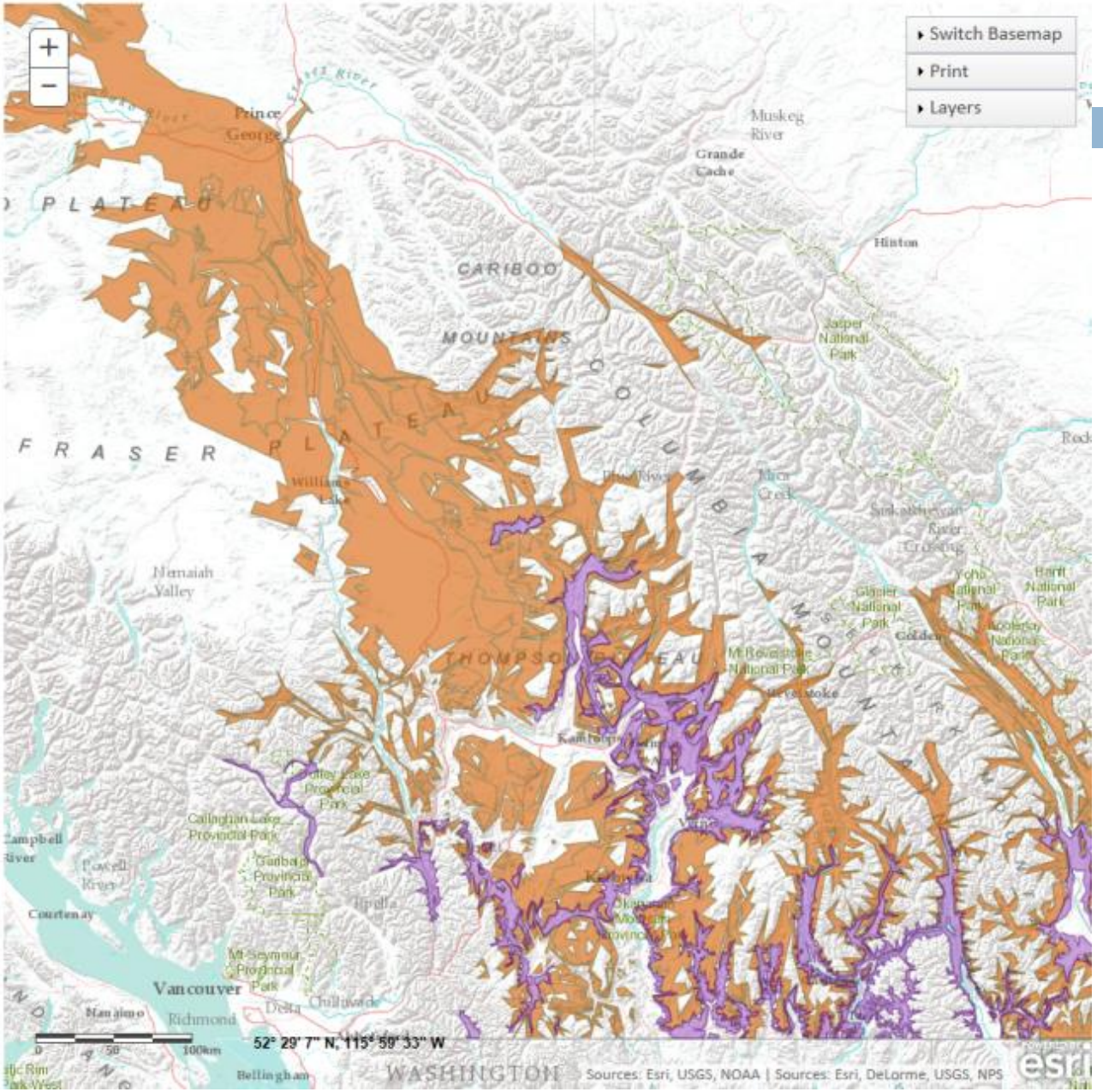
ICHdw4

GO

Plantation BEC	Seed BEC	Species Suitabililty	Limit
ICHmk2	ICHdw4	Suitable	
ICHmk1	ICHdw4	Suitable	
ICHdw3	ICHdw4	Suitable	
IDFdk5	ICHdw4	Suitable	
ICHdk	ICHdw4	Suitable	
MSdm3	ICHdw4	Suitable	
SBSdw1	ICHdw4	Suitable	
MSdm1	ICHdw4	Suitable	
SBSdh1	ICHdw4	Suitable	
ICHmk3	ICHdw4	Suitable	
IDFdk2	ICHdw4	*	
IDFdm2	ICHdw4	*	
IDFmw2	ICHdw4	*	
SBSdw2	ICHdw4	Suitable	

Area available to seedlot: 8,802,628 Ha.

*** The selected species may not be suitable in this plantation BEC variant. Please check the Reference Guide for Species Selection**



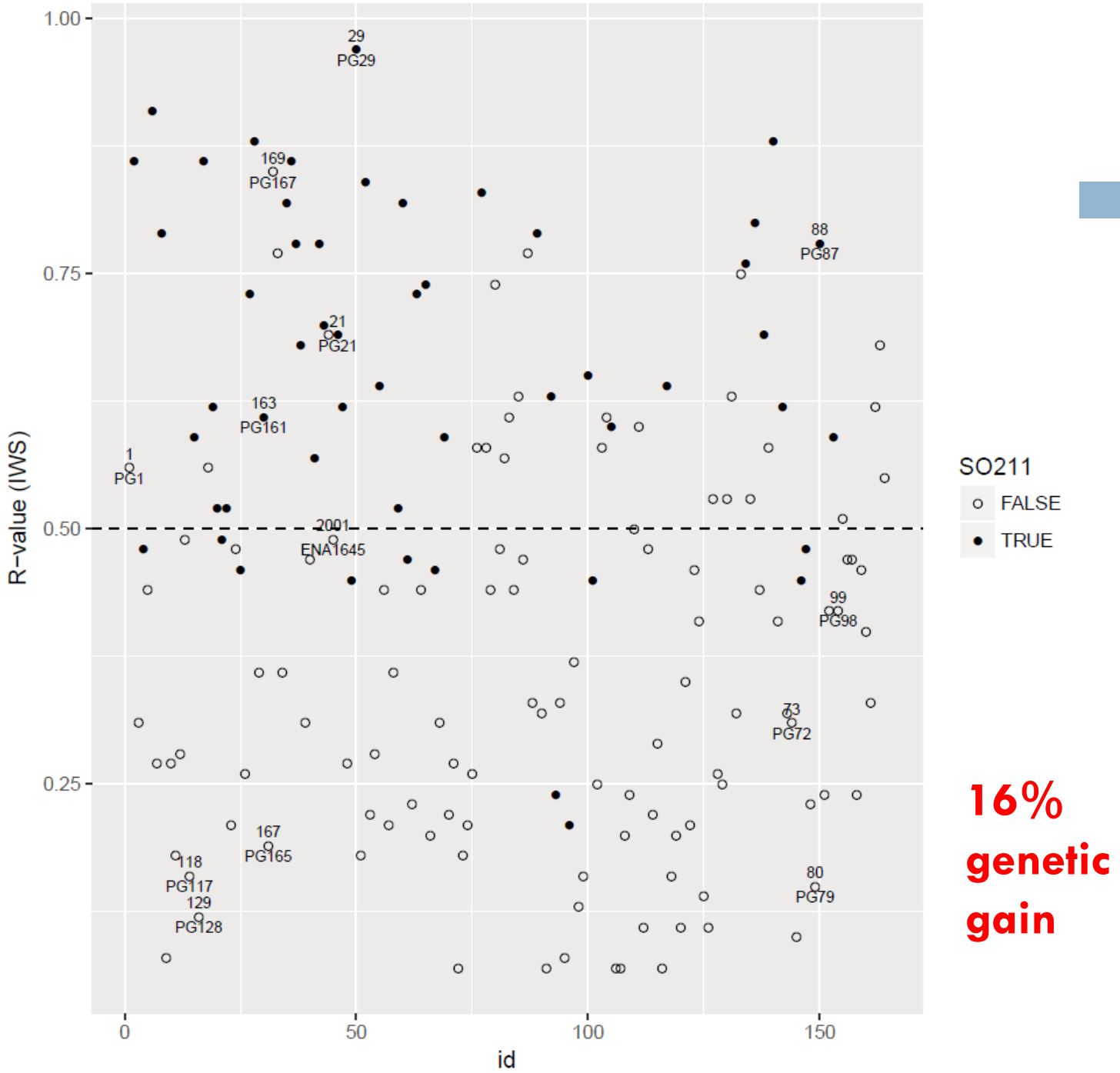
interior spruce

- TODO (long(er) term):
  - database all 750K+ progeny test records
    - Jong Leong (Saanich)
  - large MET analysis
    - (re)organize breeding pops
  - New crossing design(s) among forward selections:
    - 3rd cycle BV, PG & EK

interior spruce – weevil resistance screening.

interior spruce – weevil resistance

- 4 PG tests (11,275 records):
  - 2 raised-bed HS (VSOC SO211)
  - GBU – RxR, RxS, SxS crosses
  - PG S2 cycle 2 FS progeny test
- genetic group
  - accounts for relatedness among pollen donors in VSOC SO
- 164 R-values registered -> "IWS" in SPAR
  - IWS on 0-100 scale
    - 0 susceptible
    - 100 resistant
    - 50 population mean



16% genetic gain

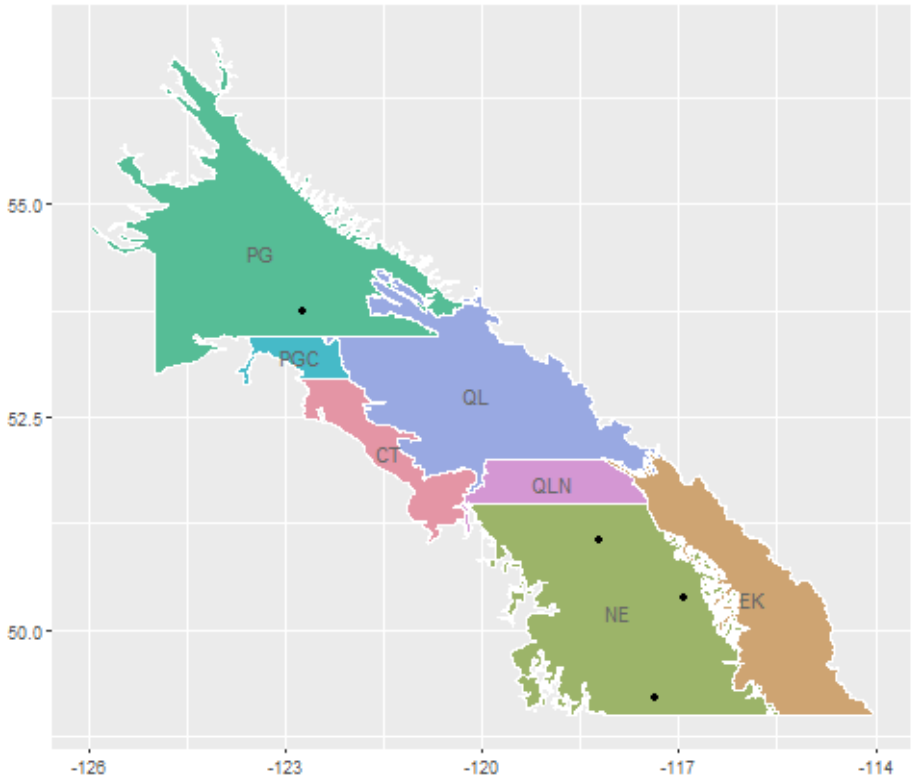
interior spruce – weevil resistance

- Strategy:
  - use artificial (uniform) infestation tests
  - supplement with field test, if attacks uniform
  - jointly analyze all data, update R-values (IWS)
    - NOTE: the population mean will shift!
- 2019 - plan to build more raised beds

interior spruce – weevil resistance

- Complete:
  - PG: R-values (IWS) in SPAR
- Current:
  - Nelson SO parents
    - infested 2018
    - record damage 2019
- TODO:
  - Bulkley Valley (+ Sitka)
    - sow 2019
    - plant/infest 2020
  - EK
  - FWDSEL: PG, BV & EK

Douglas-fir (short term)



- 2019 project
  - database all progeny test records Jong Leong (Saanich)
    - 250,000+ records?
  - large MET analysis.
  - Use to guide:
    - breeding pop development
    - testing locations
    - orchard recommendations?

Douglas-fir (medium term)

breeding populations	% complete (2018)	test year
NE low (elite)	75	2021
NE low (mid)	96	2022
NE high	90	4
EK	52	4
QL	81	3
CT	84	5
CP	74	5

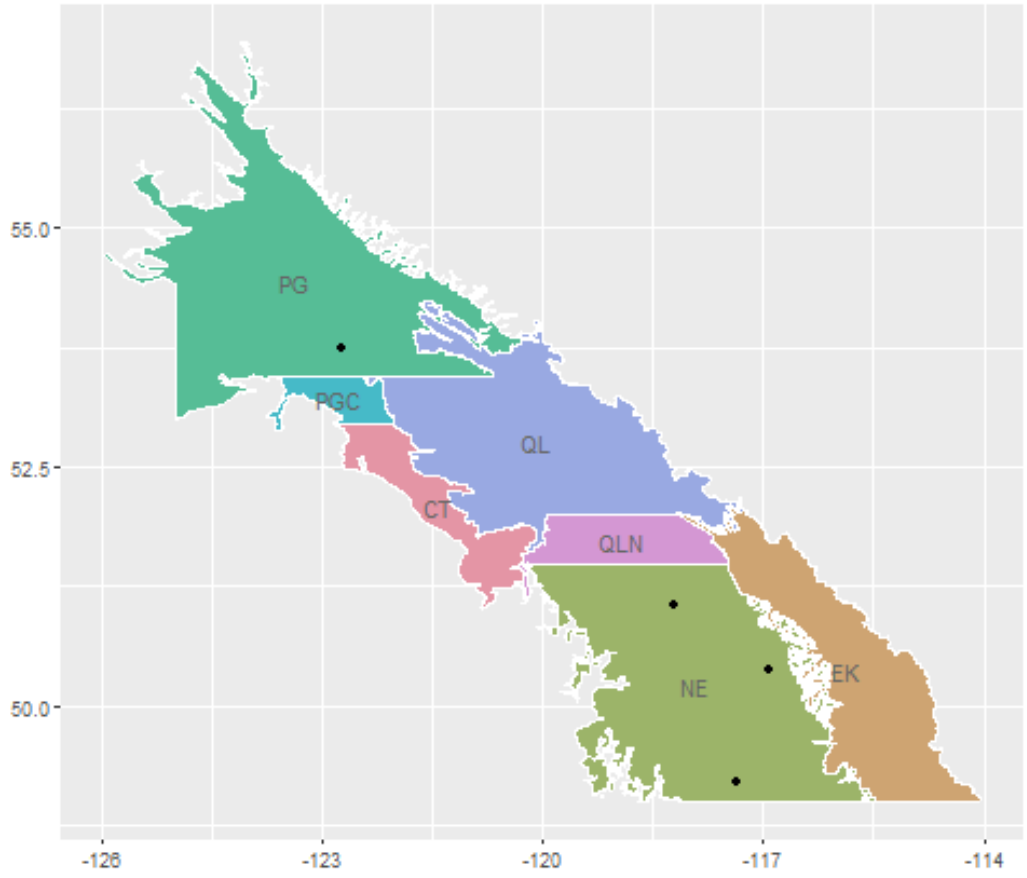
- 2nd-cycle progeny tests
- NE low crossing complete
  - large, split in two series
- other breeding groups (zones) mostly complete
  - focus on crossing between groups to link them
  - test together
- ~5 years of testing

Douglas-fir (short term)



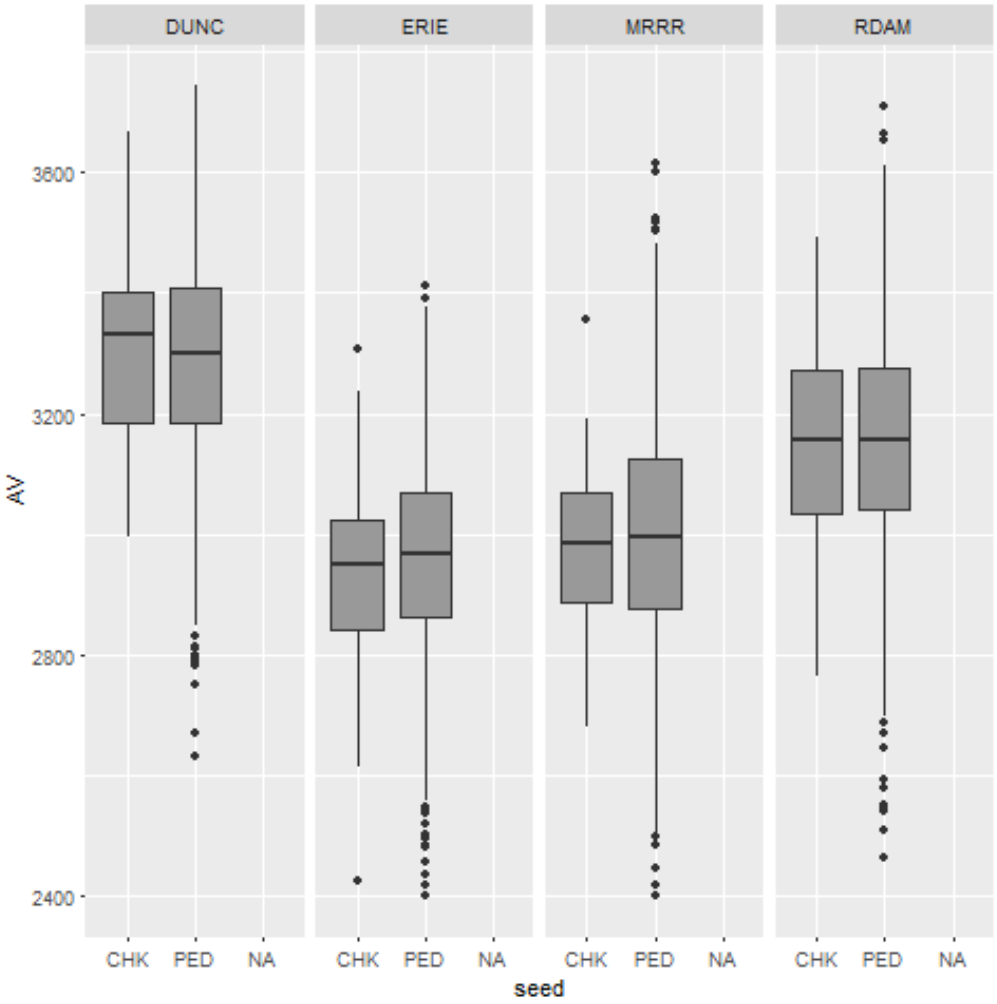

- collect acoustic velocity measures (1st-cycle)
  - surrogate for wood quality (fibre angle)
  - OP/HS progeny tests, ~30-years old
- little/no GxE means
  - response consistent across sites
  - 1 site/series
- 4 tests characterized to date (next)

Douglas-fir (short term)



- Acoustic velocity
  - 2017
    - NE low (DUNC) 640m
    - NE high (ERIE) 1300m
  - 2018
    - MR (PG) 790m (SBS)
    - Mica (Revel) 610m
  - 2019 2 tests
  - 2020 2 tests

Douglas-fir (short term)



- Acoustic velocity
  - strong site effect
    - low elevation, warm site > better quality
- wood milling study proposed (2019)
  - Julie Cool (UBC)
  - test if we can predict higher value wood, with non-destructive measures of wood quality
    - acoustic
    - relative density

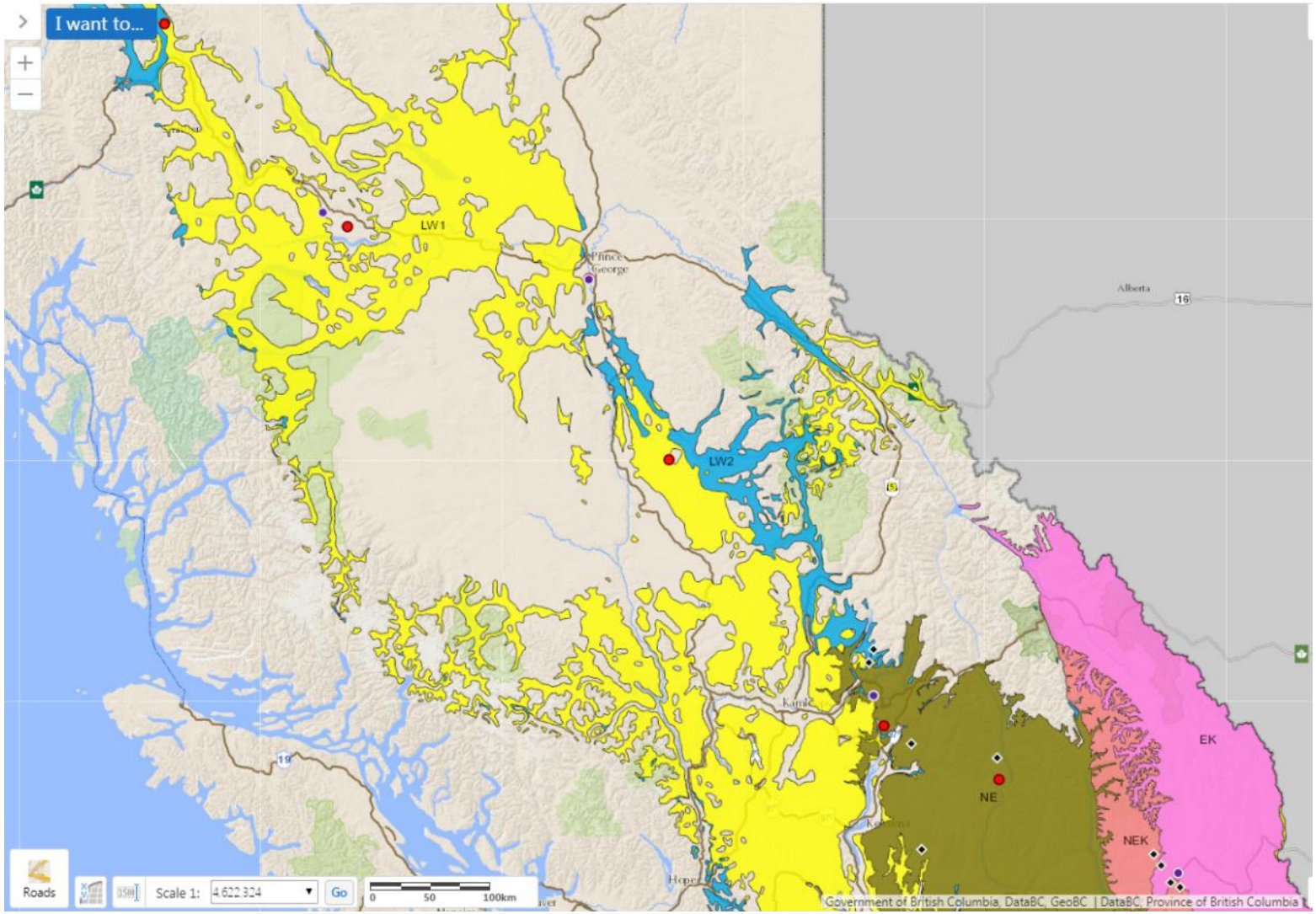
Douglas-fir (medium term)

- protocol to inoculate seedlings with Armillaria ostoyae (root rot)
  - A.o. collection
  - A.o. isolation
  - A.o. culture
  - infect seedlings
    - thanks: Michael, Ward, Marie, Renate (UBC)

western larch

- 2nd-cycle progeny test establishment complete!
  - 11 sites total
    - 4 EK breeding group tests (2018)
    - 7 NE breeding group tests (2017)
      - 3-year measures and survival assessment (2019)

western larch – progeny test locations



western larch

- 1st-cycle progeny & provenance tests, contained material from USA
- scion collection (2019)
  - best 40 individuals in 40 families
  - top 60 individuals, ~2 per provenance
- will cross into BC material
  - genetic variation for growth & adaptation

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staff autumn 2018

Sx NE low cycle 2 seedling lift