Predicting seed demand and supply

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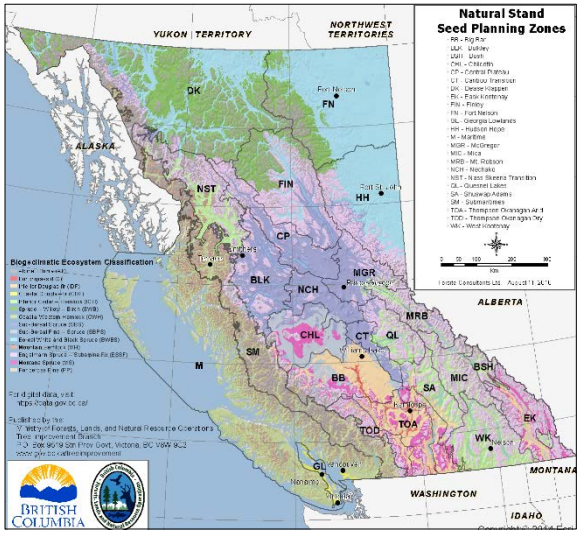
Seed before seedlings

- ~ 260 million seedlings planted in BC annually
- 15 + species
- 24 natural-stand seed zones
- Multiple elevation bands
- > 55 class-A seed planning units
- >75 timber management units
- Many licensees, large and small



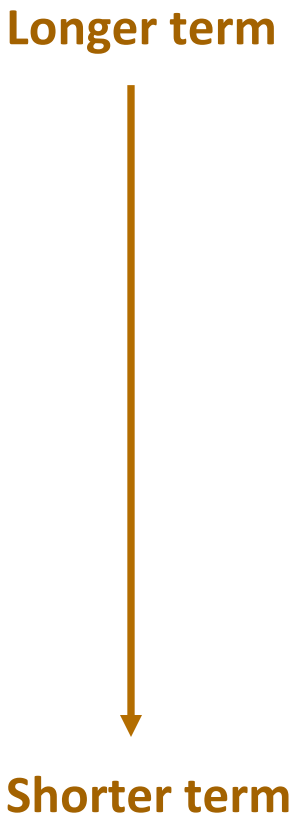
The cost of no seed often exceeds the cost of too much seed

- No seed = no planting
  - Higher plantation establishment costs
  - Delayed free growing
  - Higher reforestation liability
  - Etc.

- Too much seed
  - Carrying additional inventory – boss and CFO on your back
  - But,
    - You could sell some (maybe)

Seed planning perspectives and expertise differ

- FLNRORD and FGC
  - Planning for an efficient system
  - Licensee support
- Large licensees and BCTS
  - In-house expertise
  - Complex needs; multiple species and zones
  - Able to acquire and manage substantial inventories
- Small licensees
  - Little in-house expertise
  - Straight-forward needs; few species and zones
  - Often purchase from others when ordering seedlings

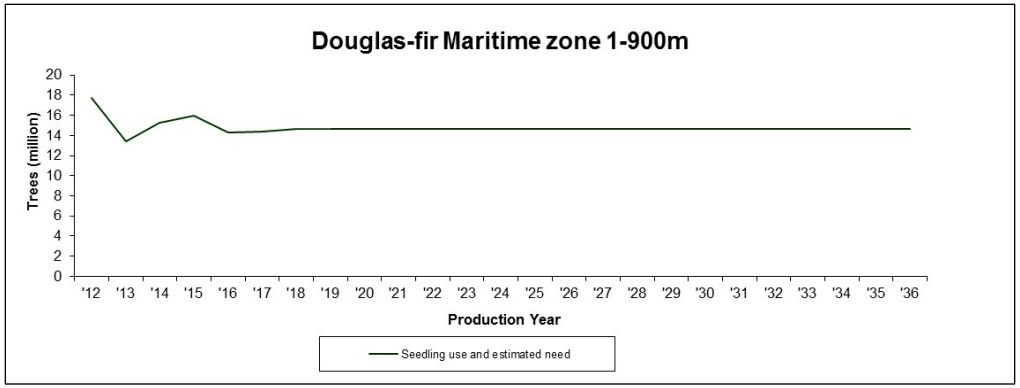


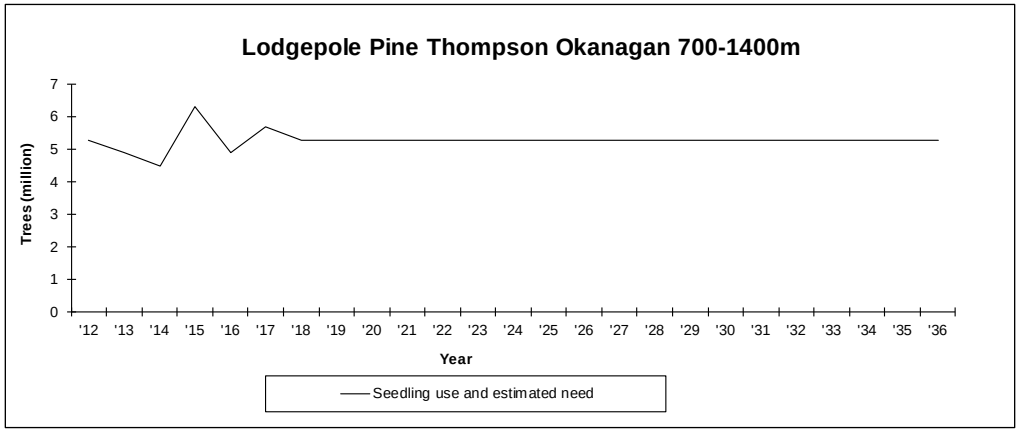
Class A vs Class B (B+) planning horizon

- Class B and B+ (wild seed)
  - 3 to 8 year horizon; pick crops when they are there
- Class A (orchard seed)
  - 30-year horizon
  - 10 years on investment before getting a significant amount of seed
  - About 15 to 20 years of good production
  - Ongoing costs and risk of stranding capital with overproduction

Predicting future seed demand

- Past demand
  - Actual seed use from SPAR (accurate and reliable)
  - Previous 5-year average used for guidance in species plans



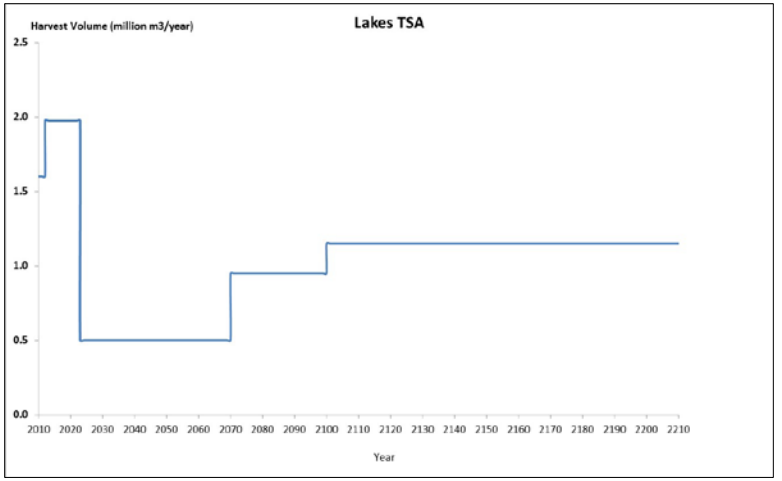


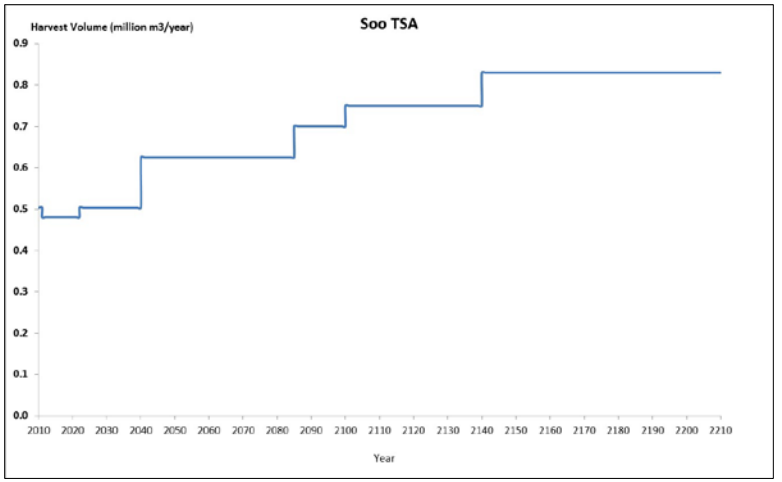
Predicting future seed demand

- Past seed demand does not necessarily reflect future demand
  - Changing Allowable Annual Cuts
  - Pests and fires
  - Silvicultural knowledge and trends
    - Species preference
    - Planting density

Using timber supply forecasts

- FLNRORD forecasts timber supply by Management Unit
- Prorate future timber supply to seed planning units using geographic overlay
- Estimate future seed need based on past seed use with adjustments for timber supply forecasts
- Timber supply forecasts do not well consider elevational and species trends
  - i.e. logging is going to higher elevations
- Timber supply is not Allowable Annual Cut





Aggregating local knowledge

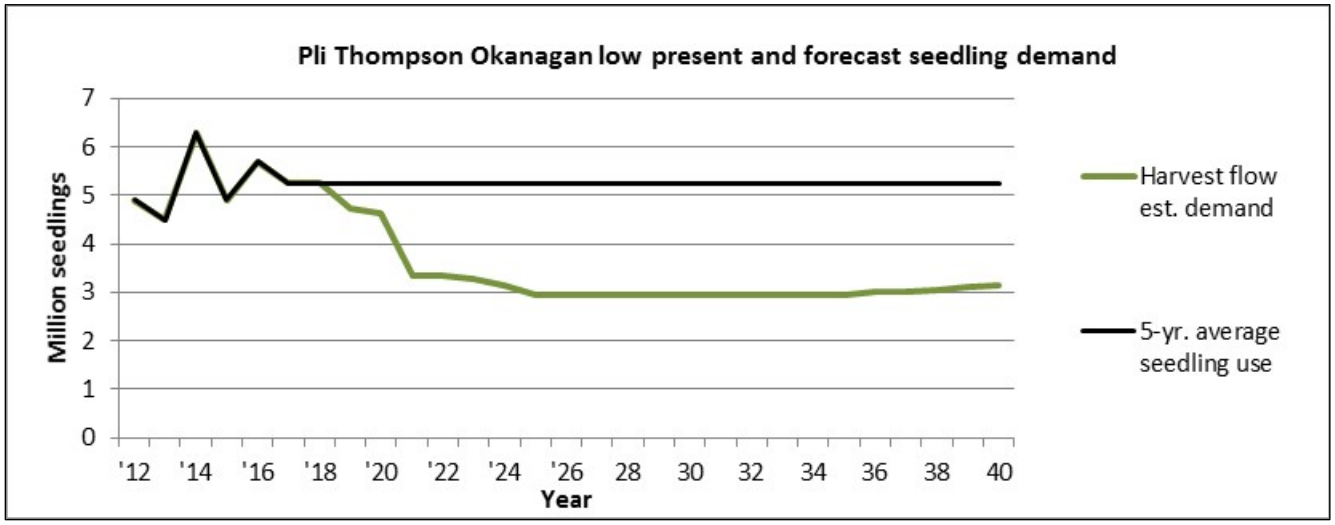
- Foresters understand trends in their areas
- Better integration of
  - Timber supply trends and AAC
  - Harvest trends (species, elevation, etc.)
  - Silvicultural trends (species, planting densities, etc.)
- Issues:
  - Trends change
  - Pests and fires are still unknown
  - Difficult to get information from all areas
  - Conflicting information (Forester A has a different opinion than Forester B)

How well have forecasts worked?

- 5-year historic use is a decent predictor for future seed demand
- Big trends result in long-term shifts
  - Post beetle timber supply in some areas
  - Planting massive fires

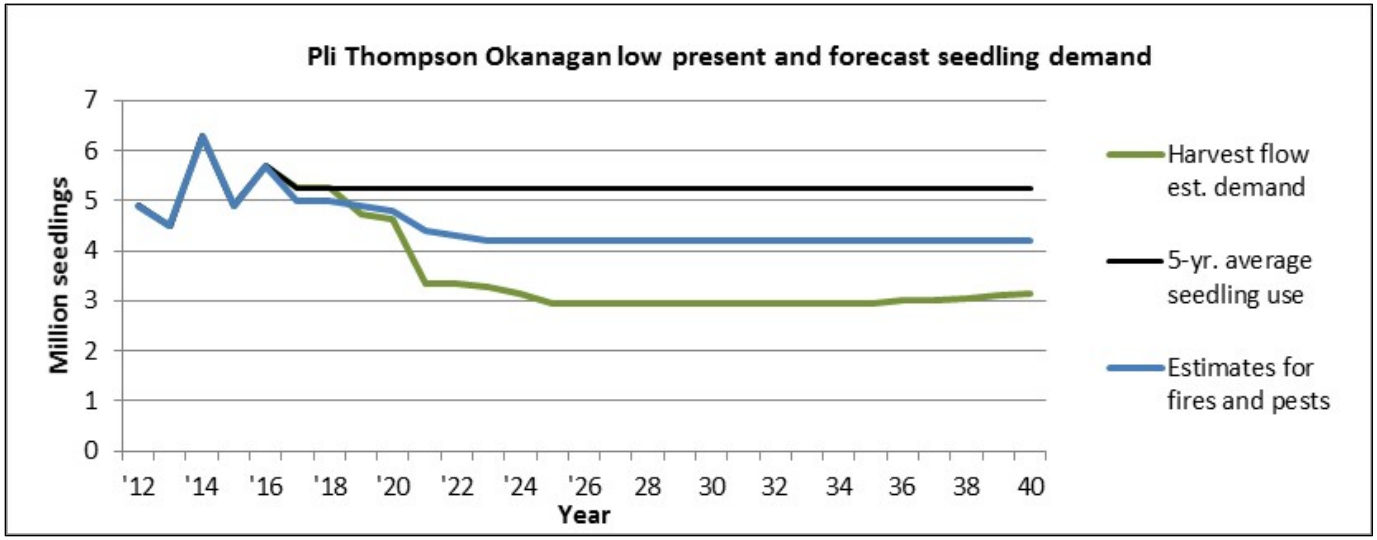
What is the best way to forecast seed demand over the next 2 to 3 decades?

- Start with 5-year historic use
- Consider big trends such as large timber-supply changes

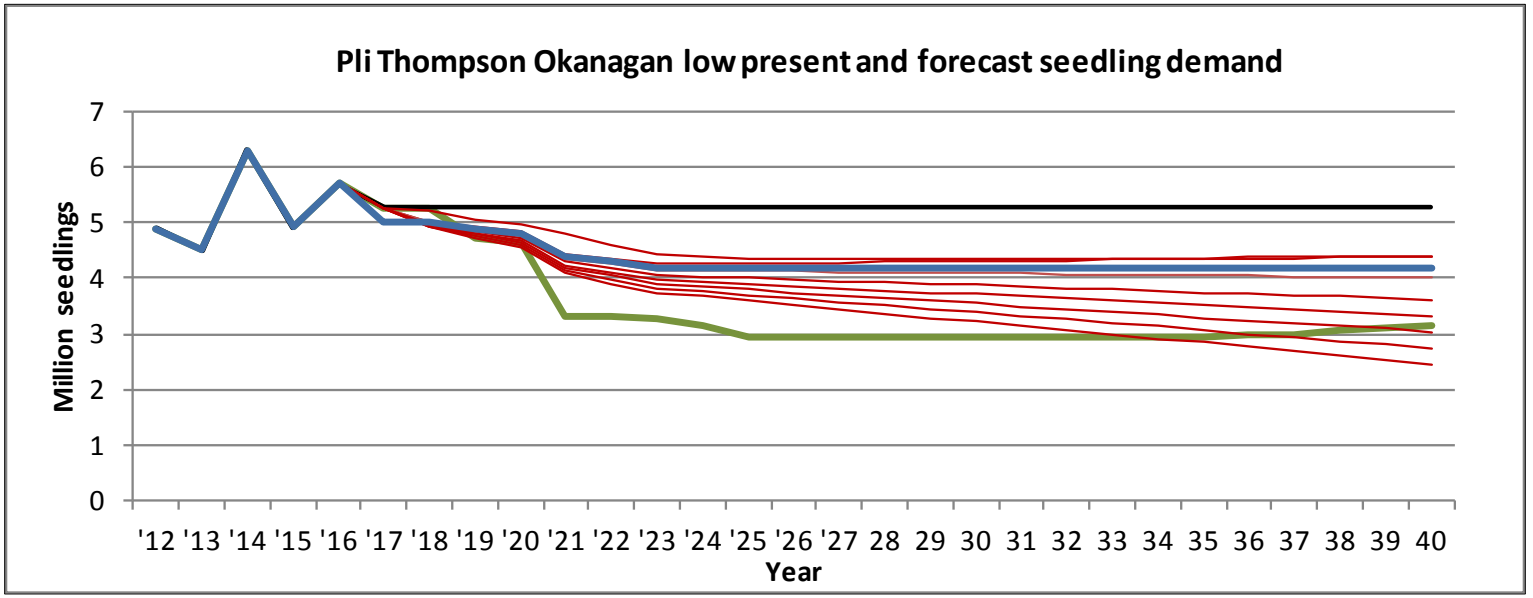


What is the best way to forecast seed demand over the next 2 to 3 decades?

- Factor in contingencies
  - Fires and associated planting programs
  - Pest outbreaks and trends
  - Climate change (more on this later)
- Adjust a 5-year trend line up or down accordingly
- Review and adjust periodically



In reality, estimates will have a lot of error



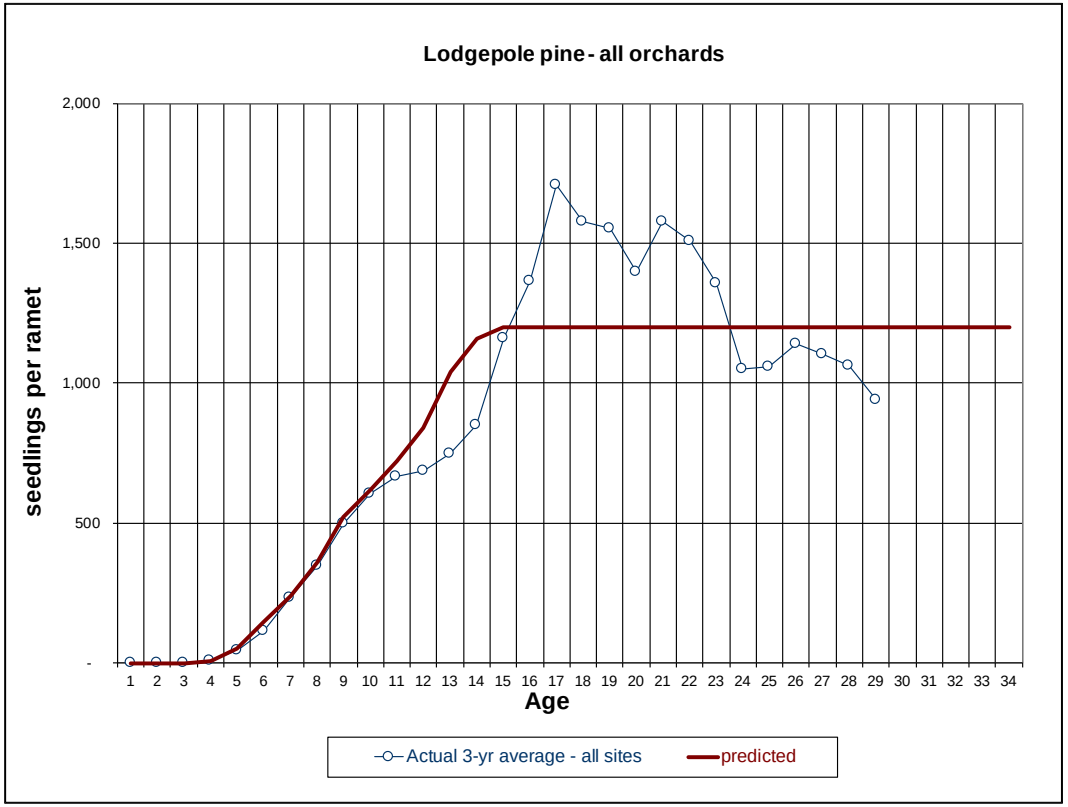
- A reasonable estimate is possible
- The precision of the estimate isn't necessarily worse than our ability to estimate supply….

Estimating orchard seed supply and orchard needs

- Elements to consider
  - Seed production per orchard ramet
  - Nursery sowing factors (seeds per seedling)
  - Seed production variability among orchard sites and breeding populations

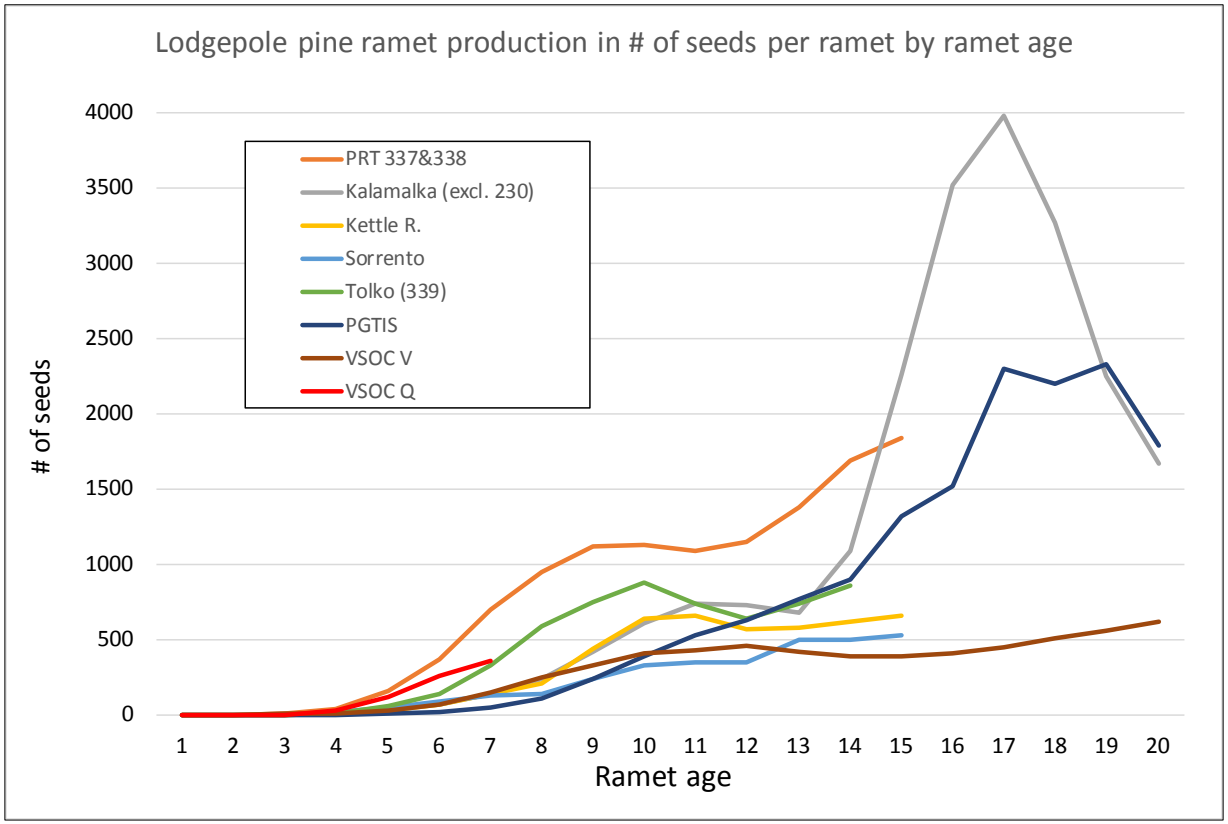
Estimating seed production per ramet by age

- Substantial historical data available (30+ years of production)
- Orchard management techniques improve
- Reach consensus for planning

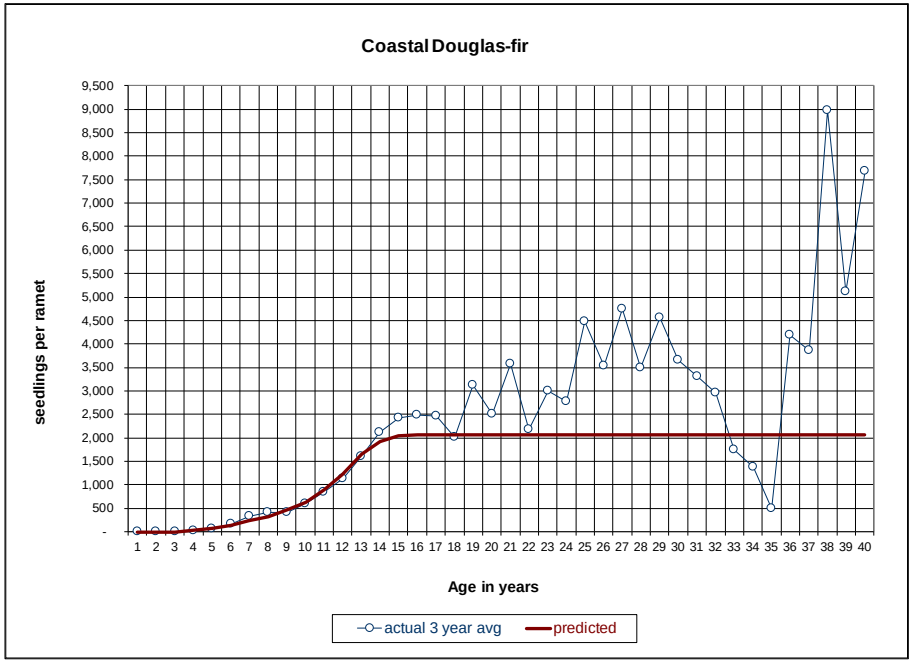


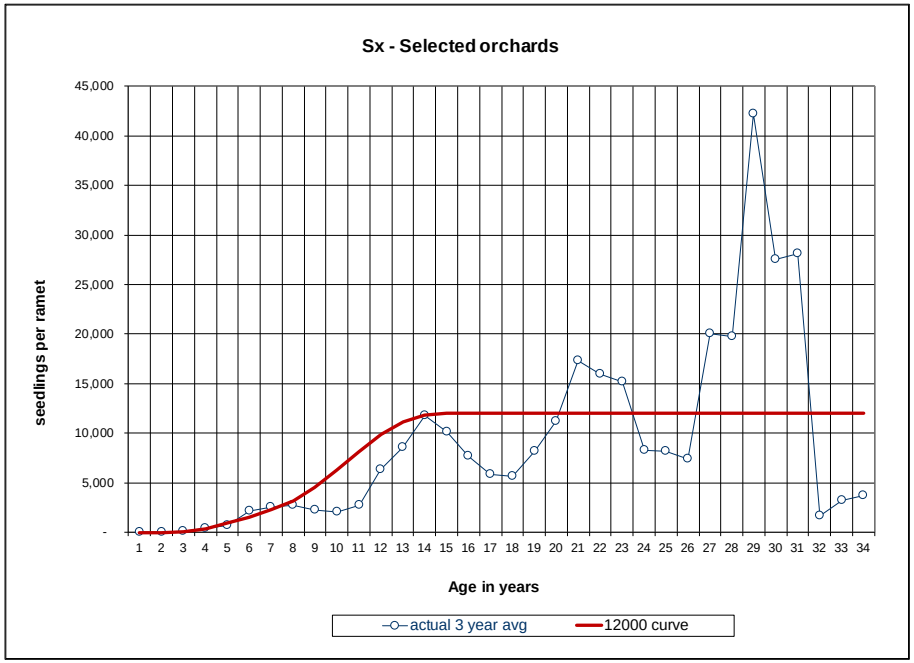
Site variability: lodgepole pine example

- All sites are not equally good for seed production
- Northern Pli populations produce less well than southern populations



Production estimates are pretty good for most species



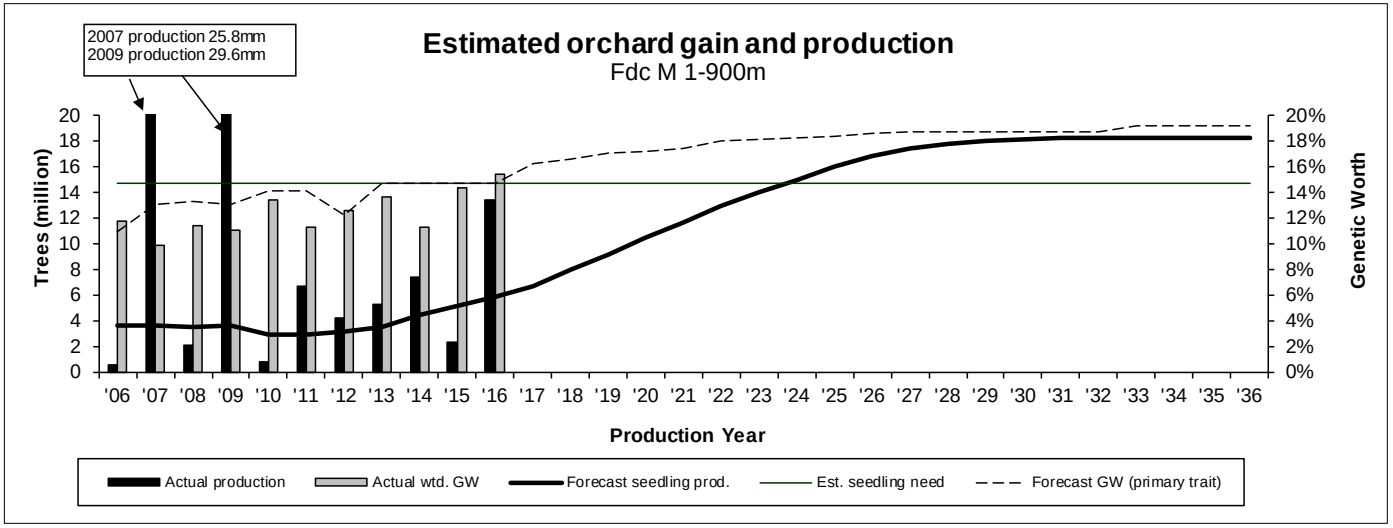


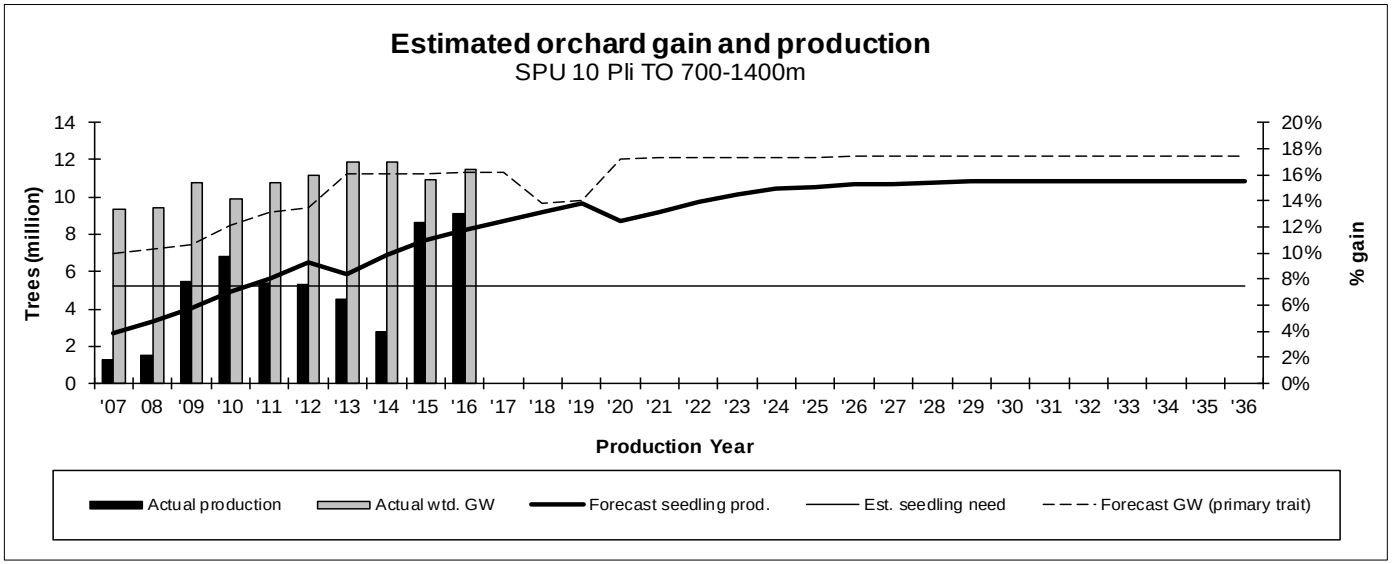
- Orchard need = seed need ÷ mature ramet annual production

Nursery sowing factors

- Highly variable by
  - Nursery
  - Client
  - Over time
- Seek to promote less seed use
  - Class A seed is expensive
- Conflicting interest between nursery and client
- Sowing factors used are estimates pulled together from nursery, seed user, and seed seller experience

Putting it all together:
Species plans seed supply and demand graphs





Climate-based seed transfer

- Substantial changes to the deployment areas for orchard seed
  - BEC variants are the geographic unit
  - Seed deployment to a group of BEC variants
- Changed future seed demand
- Changes needed in orchard supply

BECvar in which seed from orchard 240 (Pli Bulkley Valley, Sorrento) can be used

The “Deployment Zone” for orchard 240 seed

Estimating seed demand under CBST

- Estimates of past seed demand by BEC variants and species
- Aggregate past seed use across BEC variants
- All of this is a work in progress……..