

Cone and Seed Pests

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Wild Stand Cone Collection Workshops
June 2018

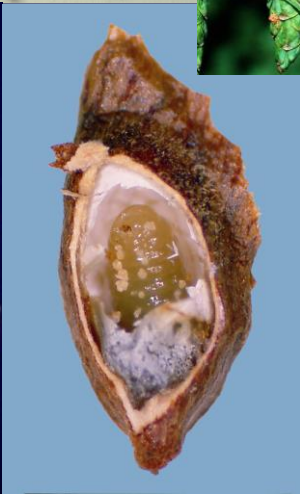
Special thanks to Ward Strong, Robb Bennett, Jim Corrigan, Dion Manastryski and Sandra Kegley for many of the photos and slides used in this presentation



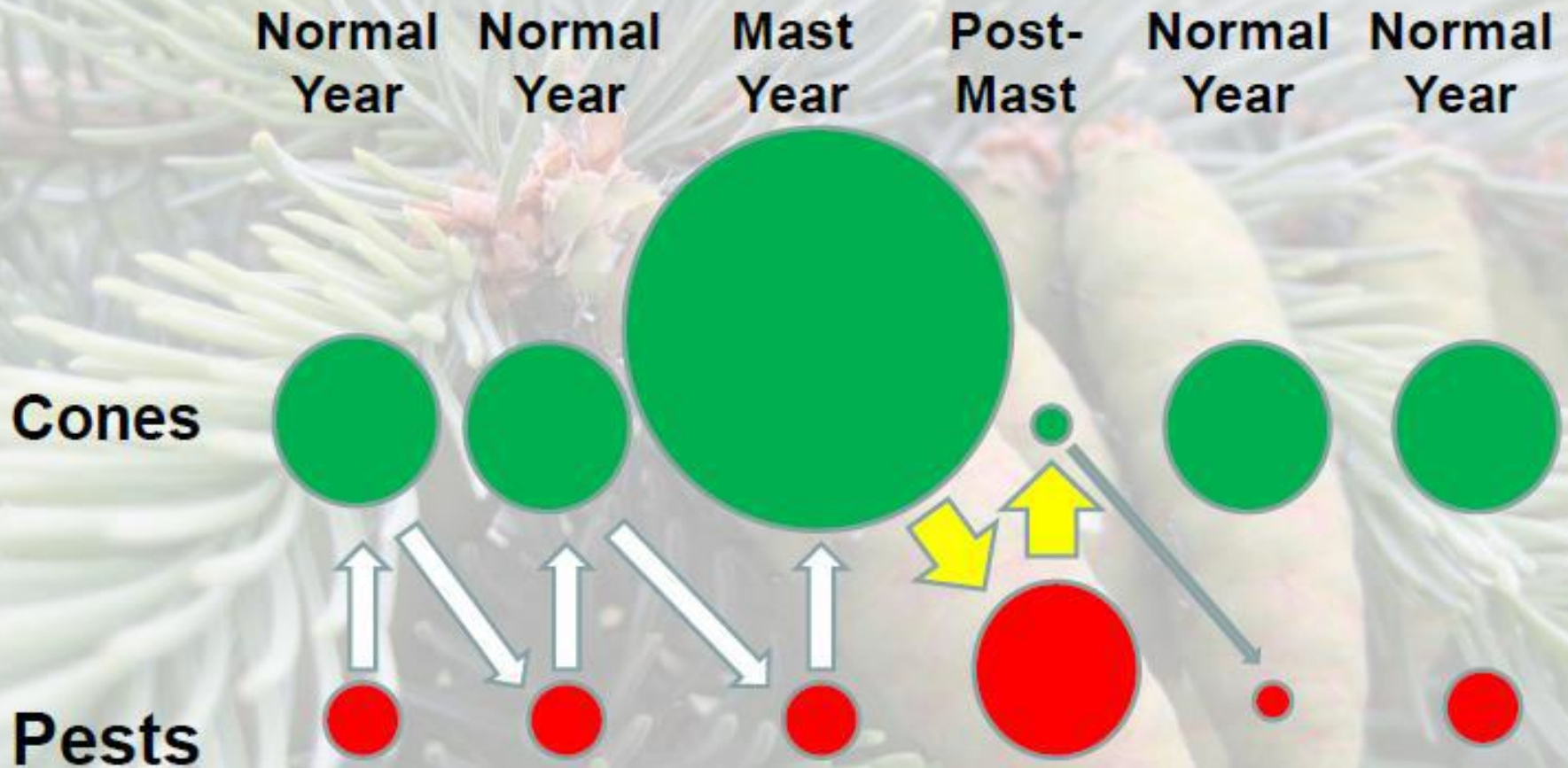
Wild Stand Context

- Most current work on cone and seed pests is focused on ‘control’ measures in seed orchards
- Wild stand collections generally cannot ‘afford’ pest control measures – that makes pest monitoring important – ‘don’t waste your \$’
- Pest populations can increase quickly, so repeated monitoring over time is important!
- Monitor for pests based on **Random** cone samples that are **Representative** of what you plan to collect
- Pest populations can be high enough that it isn’t worth collecting the cones – sometimes abandoning the ship is the right call

How Bad can it Get?



Big Crop – Small Crop Ecology



Notes: In normal years, the pest population takes a small proportion of the crop. The mast crop overwhelms the pest populations' abilities to exploit a large volume of host material, but all the pests find cones for reproduction. In the post-mast year, unusually large pest populations are attacking an unusually small cone crop. While this crop will be devastated, the small number of cones available for attack in the post-mast year reduces the pest populations to very low levels for the next growing season.

Orchard Seed Use Overview (Interior)

- If seed with a Genetic Worth (GW) ≥ 5 is available it must be used for crown land reforestation = seed orchard seed
- What happened in 2018 (% Wild Stand Seed Use)

Species	Wild Stand seed %	Total Seedlings Province
PLI	72 %	104 M
SX	5.3 %	101 M
FDI	60 %	25 M
LW	1.2 %	8.4
PW	0.0 %	1.9 M
PY	96 %	1.9 M
CW	100% in interior	11.4 M

Orchard Seed Use Overview (Coast)

- If seed with a Genetic Worth (GW) ≥ 5 is available it must be used for crown land reforestation = seed orchard seed
- What happened in 2018 (% Wild Stand Seed Use)

Species	Wild Stand seed %	Total Seedlings Province
BA	100 %	1.3 M
FDC	8.7% (only 2% in M SPZ)	13.4 M
PW	0.0%	1.9 M
HW	48% (only 3% in M SPZ)	2.4 M
SS	21 %	0.8 M
YC	39 % (rest is cuttings)	1 M
CW	43% (only 12% in M SPU)	11.4 M

Non-Cone Feeders (tree health Issues)

➤ **INDIRECT** - tree health can impact ability to produce cones and seed (i.e. bark beetles)



Oligonychus ununguis
"Spruce spider mite"



Choristoneura fumiferana
Spruce budworm



Synanthedon sequoiae
"Pine pitch moth"

cone and seed insects = Conophytes

Facultative about 45 species in Canada

- **Cone independent** - May feed on cones, doesn't have to feed on cones
 - Relatively stable populations
 - Cyclic
 - Host generalists
 - Tissue generalists
 - Large # eggs
 - Oviposition not very picky



Obligate Conophytes

- Cone dependent – about 55 species in Canada
 - More unstable populations, competition among
 - Host specific
 - Tissue specific
 - Few eggs in cones
 - Often single eggs



External Cone Feeders

Aphids, Adelgids, Elatobium and Pineus - Oh My!

- Sap-sucking insects / some form galls
- Alternate hosts (i.e. Sx-Lw) and complex life cycles
- Aphids are general pests - Adelgids feed only on conifers
- Tree, cone and seed health unaffected, BUT seed extraction may be compromised w /larch adelgid
- Replace cone producing sites



Adelges lariciatus
"Larch adelgid"



Pineus pinifoliae

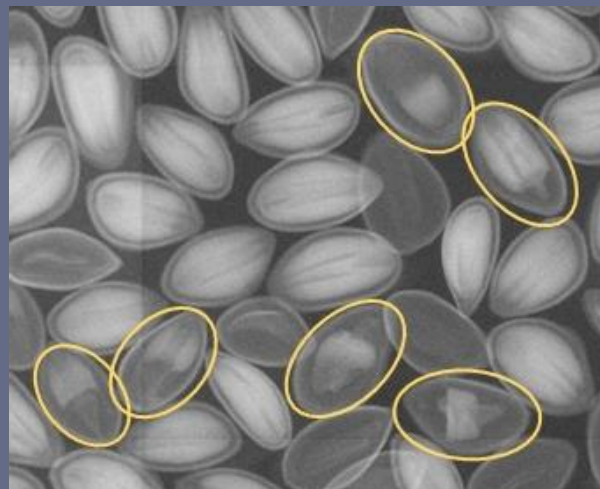


Adelges cooleyi

Leptoglossus occidentalis



- Western conifer Seed Bug
- Seed-sucking insects – insert syringe-like mouthparts through scale into seed, injects digestive enzymes and sucks contents out of seed
- Seed loss can be very high, but the bug can be evasive to monitoring efforts
- Damage not obvious, except from x-rays



Internal Cone Feeders

Dioryctria abietivorella = fir coneworm

- Impacts many conifer species (**severe**)
- **Continues feeding AFTER cone harvest !!!!**
- Usually entrance holes and frass are obvious



My best guess...
Dioryctria pseudotsugella,
the so-called
Douglas-fir
coneworm.
Photographed by
Dave Kolotelo.



Contarinia oregonensis

- Douglas-fir cone gall midge
- Fdc specific, can cause major crop damage
- Larvae chew into cones, form Galls that inhibit seed development and restrict seed extraction



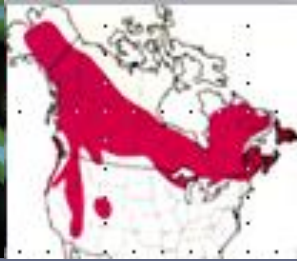
Strobilomyia neanthracina

- Spruce cone maggot, Spruce spiral cone borer
- Larvae bore through cones around axis
- Destroy seeds, leave spiral tunnels & frass
- 2-3 larvae/cone can consume all seeds



Cydia strobilella

- Spruce seed worm
- Larvae bore through cone tissue and into individual seeds – seeds may be fully or partially consumed
- Cones open premature – no other external sign of damage



Kaltenbachiola rachiphaga

- Spruce cone axis midge
- Larvae tunnel through cone scales and into cone axis
- Does not directly destroy seed
- Cones can dry and open prematurely and seed can be difficult to extract



Barbara colfaxiana

- Douglas-fir cone moth
- Larvae tunnel around axis feeding on scales and seeds (possibly several/cone)
- 1 larvae can consume 60% of seeds, 3 can consume 100%
- Damage seen as misshapen cones, small bore holes and frass
- A bigger pest in hotter, drier climates



Conophthorus ponderosae



- White pine cone beetle
- Adult females tunnel at base of cone and kill cones
- Eggs laid near cone axis and larvae emerge and consume cone and seed tissues
- Cones generally fall to the ground prior to seed maturation
- Can have a huge impact on the cone crop



Internal Seed Feeders

Mayetolia thujae

- Redcedar cone midge
- Larvae can destroy entire CW crops
- larvae feed on seeds and form a cocoon in the fall
- Infested cones smaller



- ***Megastigmus spermotrophus***
- Douglas-fir seed chalcid, + other species
- Can be a major pest
- Females lay one egg near seed which will enter seed and feed on contents
- Damage only seen via x-rays



Fungal Problems

- We have assayed for 3 seed-borne pathogens in BC
- *Fusarium* spp., *Caloscypha fulgens* and *Sirococcus conigenus*
- *Caloscypha* has cone collection implications
- This fungus can infect cones that have come in direct contact with soil
- It is a concern with squirrel cache collections that have soil contact, especially during wet weather
- *Caloscypha* (cold fungus) has the unique ability to grow well at low (2-5 C) temperatures

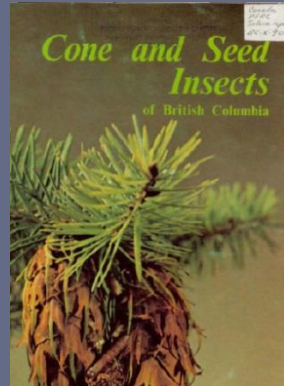
Resources

- FGC Pest management Leaflets – 14 ‘common ‘ pests.

<http://www.fgcouncil.bc.ca/doc-09-pestmaninfo.html>

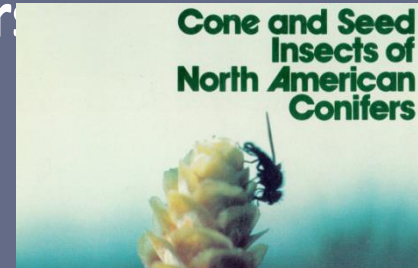
- Cone and Seed Insects of BC

<http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/3955.pdf>



- Cone and Seed Insects of North American Conifers

<http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/2026.pdf>



- Northern Region Cone and Seed Insect Handbook

<http://fsweb.r6.fs.fed.us/natural-resources/seed-genetics/>

Northern Region
Cone & Seed Insect
Handbook

