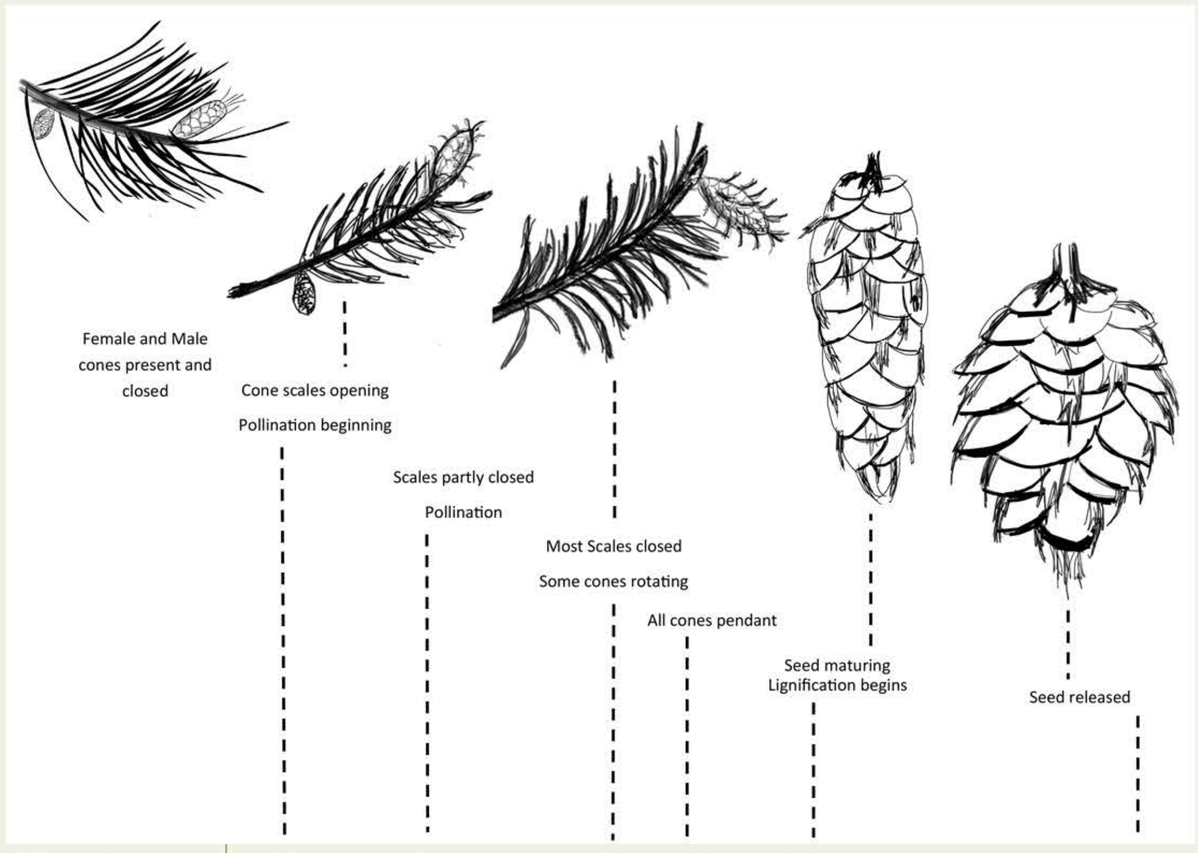
Seed Orchard Pest Management

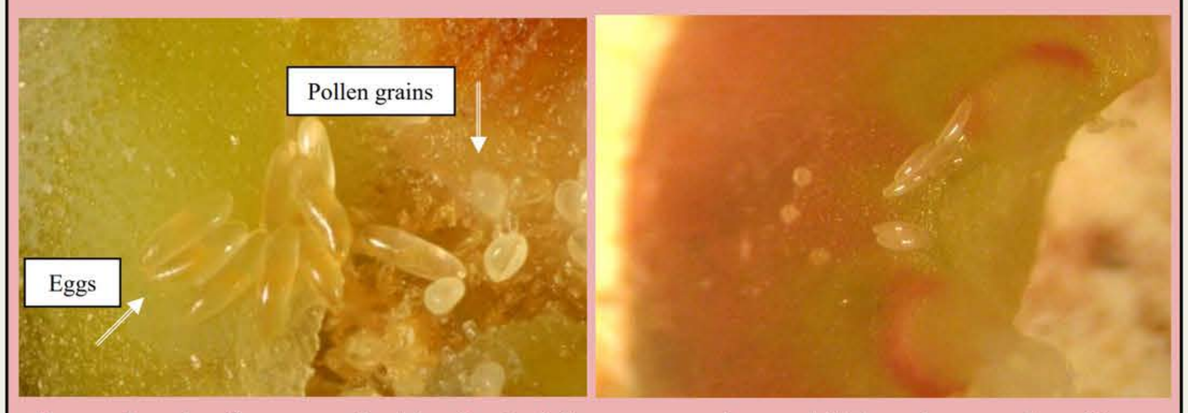
Douglas-fir—*Pseudotusga menziesii*



GDD (approximate)	150	250	300	400	1000	1500
Pheromone Traps	*	**				
Contarina	Eggs Eggs Eggs Eggs				Galls Galls Galls	
Dioryctria flight period						
Cone Dissections						
Visual Survey						
Adelgid and Mite Survey						

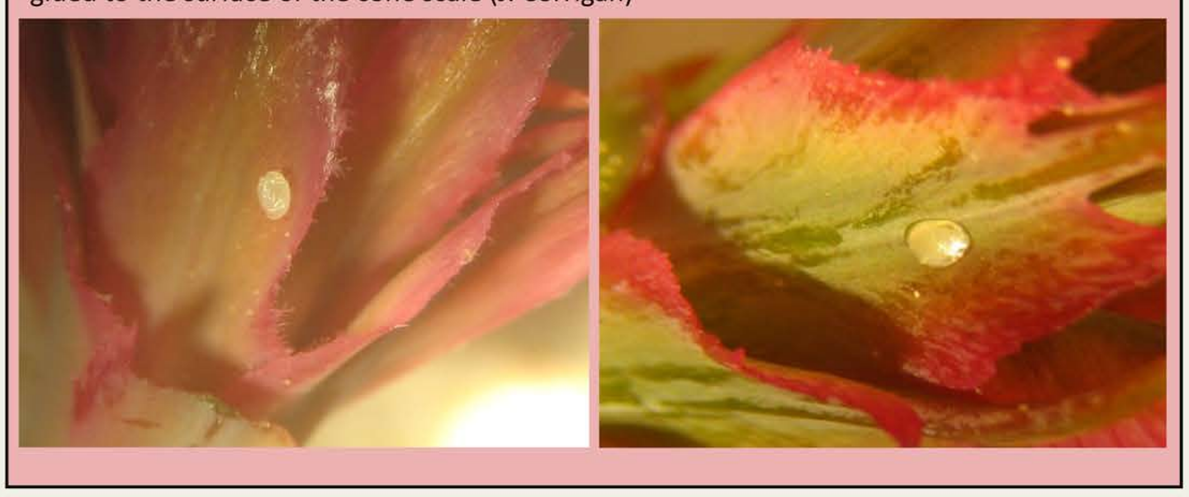
Cone Dissections

- Used for an early picture of the populations of pests that lay eggs in the cones to provide information for pest management decisions
- Ideally done at when approximately 50% of cones have closed and again when 90% of cones have closed, each orchard should be surveyed independently
- 25-50 cones collected from throughout the orchard dissected for eggs or early-instar larvae



Above: Douglas-fir cone gall midge ***Contarinia oregonensis*** eggs laid loosely on scales of two dissected Douglas-fir cone (left-D. Manastryski , Right-J. Corrigan)

Below: Douglas-fir cone moth ***Barbara colfaxiana*** eggs. These eggs are laid singly and are glued to the surface of the cone scale (J. Corrigan)



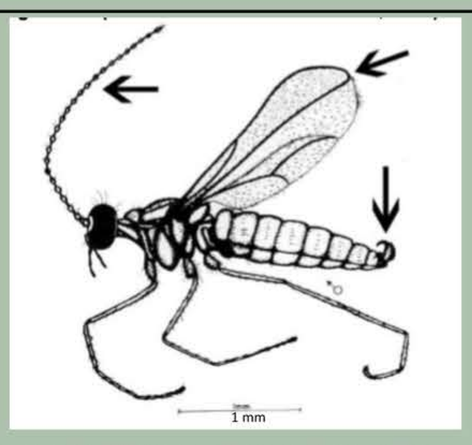
Pheromone traps

Detection of flying adult male *Dioryctria, Contarinia* and *Barbara*

- **Traps baited with *Contarina* pheromone lure can be used to monitor for both *Contarinia* and *Barbara* (place traps before cones become receptive, *3 traps per orchard**)**
- ***Dioryctria* traps should be placed at ~250 GDD** (*6 traps/orchard* suggested)**
- **Monitor minimum of once per week, Lures should be changed every 6-8 weeks**
- **Sticky trap bottoms should be changed when the trap is greater than 50% covered**
- **Trap catch can be used to guide visual surveys or application of insecticides**

Dioryctria abietivorella (above) adults (W. Strong) Adult Wingspan is 25-28 mm

Barbara colfaxiana adults (left) on Douglas-fir cone (D. Manastryski) and (right) caught in pheromone trap (W. Strong) Wingspan of adults is approximately 15-20 mm



Contarinia oregonensis (left) captured in a pheromone-baited trap (W. Strong) and (right) drawing of male *Contarinia* with arrows indicating diagnostic characteristics; antennae, wing veins, and male genitalia (from Johnson and Heikkenen, 1958). Useful characteristics for identifying *Contarinia* include: Bright orange abdomen (fresh specimens); Long antennae (approximately as long as the body), each consisting of 24 round "beads." Each bead separated by a narrow constriction approximately the same length as bead, short bristles encircle each bead; Wings with only 3 dark veins apparent. Upturned male genitalia. Droplets of red/orange 'blood' are often visible at the joins of the legs of individuals caught in traps.

Mites and Adelgids

- Surveys identify both the level of pest in the orchard as well as the current life stages.
- Treatments for these pests must be timed to coincide with active, un-protected life stages
- Care must be taken with treatment to avoid eliminating natural predators of these pests which can result in population explosions
- *Adelges cooleyi* alternates generations between spruce- and Douglas-fir
- High adelgid or spider mite levels can cause reduced tree health, defoliation, or mortality of branches

Above: ***Adelges cooleyi*** wooled-up adults on Douglas-fir foliage (eggs visible in the top-left wool mass (D. Manastryski)

Above: Overwintering spider mite eggs on Douglas-fir. These will hatch in early spring the motile stage is susceptible to chemical control (J. Corrigan).

Above: ***Adelges cooleyi*** nymphs on Douglas-fir foliage (D. Manastryski).

Visual Surveys

- These surveys provide information on pest damage in orchard
- Begin once cones are pendant or 2 weeks after first *Dioryctria* trap catch
- Should be conducted weekly in orchards that are being managed for crops, in particular when early-season treatment with systemic insecticide has not been used
- Unknown damage can be sampled to be looked at under a microscope or magnifier

Clockwise from right: Early instar *Dioryctria* larva; *Dioryctria* frass and webbing on a cone cluster; Early signs of Dioryctria feeding on a cone (all photos - W. Strong).

Early infestation signs will include small entry holes, minute frass and minor surface feeding damage. Small larvae may be visible on surface of cones