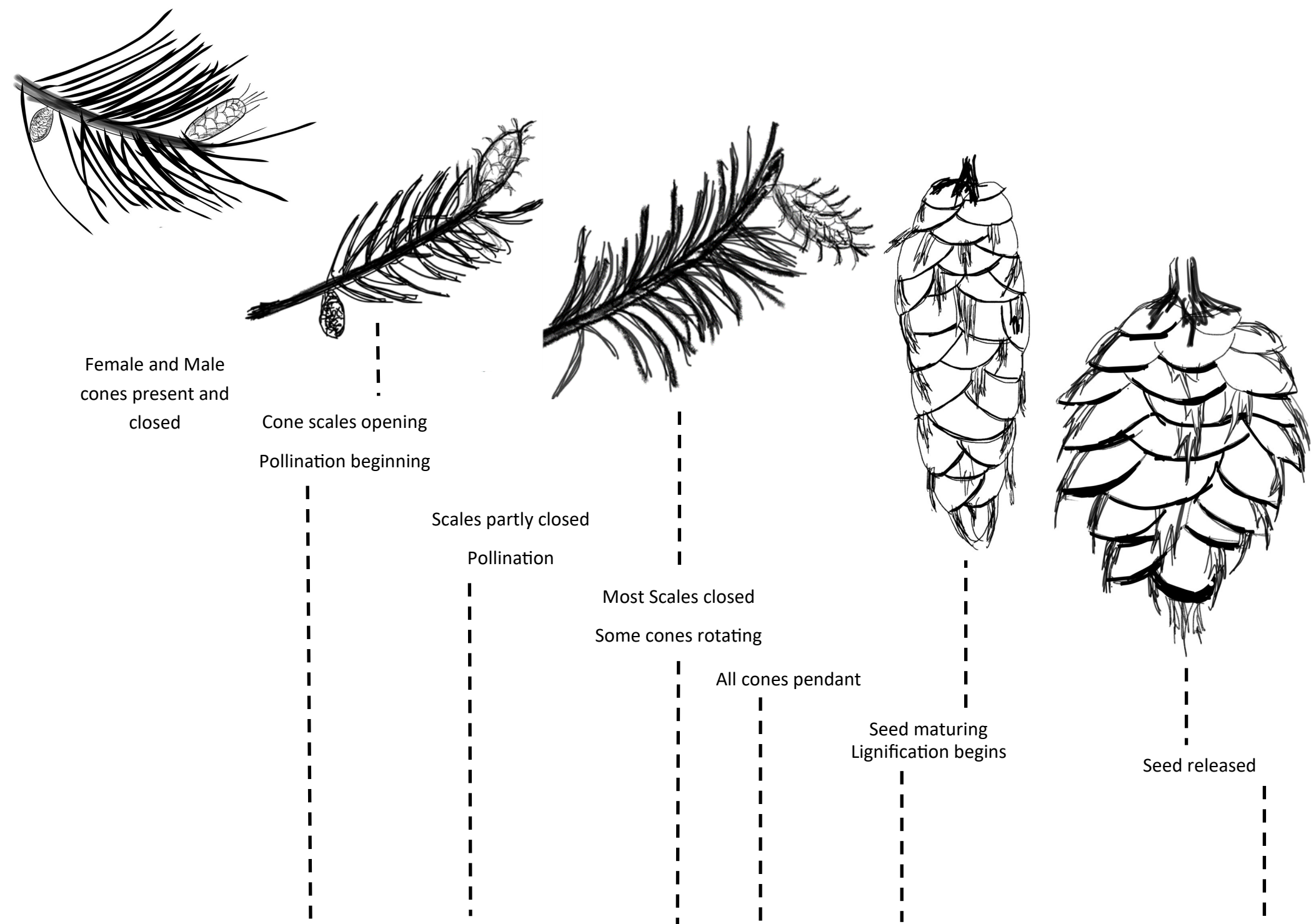




Seed Orchard Pest Management

Douglas-fir—*Pseudotsuga menziesii*



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. Manastryrski , 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)



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* woolled-up adults on Douglas-fir foliage (eggs visible in the top-left wool mass (D. Manastryrski)



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. Manastryrski).

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

Pheromone traps

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

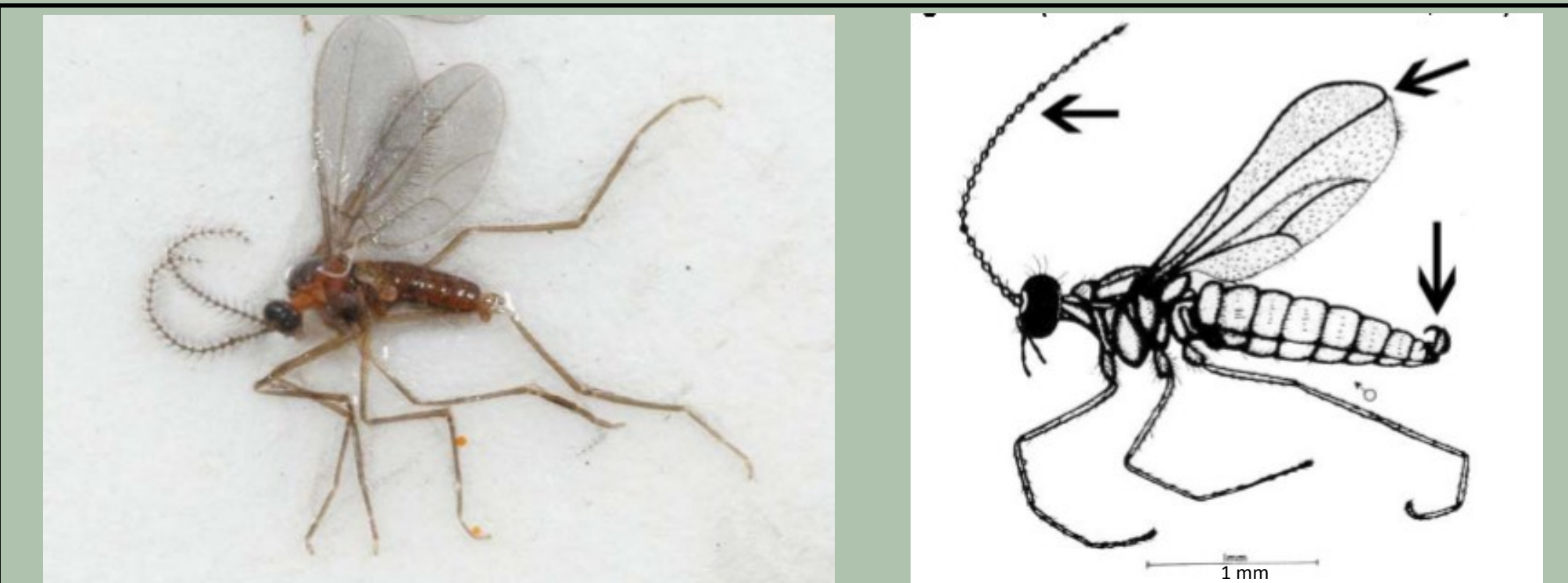
- ⇒ Traps baited with *Contarina* pheromone lure can be used to monitor for both *Contarina* and *Barbara* (place traps before cones become receptive, 3 traps per orchard*)
- ⇒ *Dioryctria* traps should be placed at ~250 GDD** (6 traps/orchard suggested)
- ⇒ Monitor minimum of once per week, Lures should 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. Manastryrski) 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 Heikkinen, 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.