

Douglas-fir Bark Beetle Biology and Management

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Kootenay Boundary

BRITISH COLUMBIA

Ministry of
Forests, Lands, Natural
Resource Operations
and Rural Development

Overview



- Welcome and introductions
- Bark beetle biology/ life cycle
- Impacts of Douglas-fir beetle
- Detection techniques
- Management

Main bark beetles



- Mountain pine beetle IBM Pl, Py, Pw, Pa, Pf, Pj
- Spruce bark beetle IBS Spruce (Se, Sw, Ss)



- Douglas-fir beetle IBD Fd (Lx)

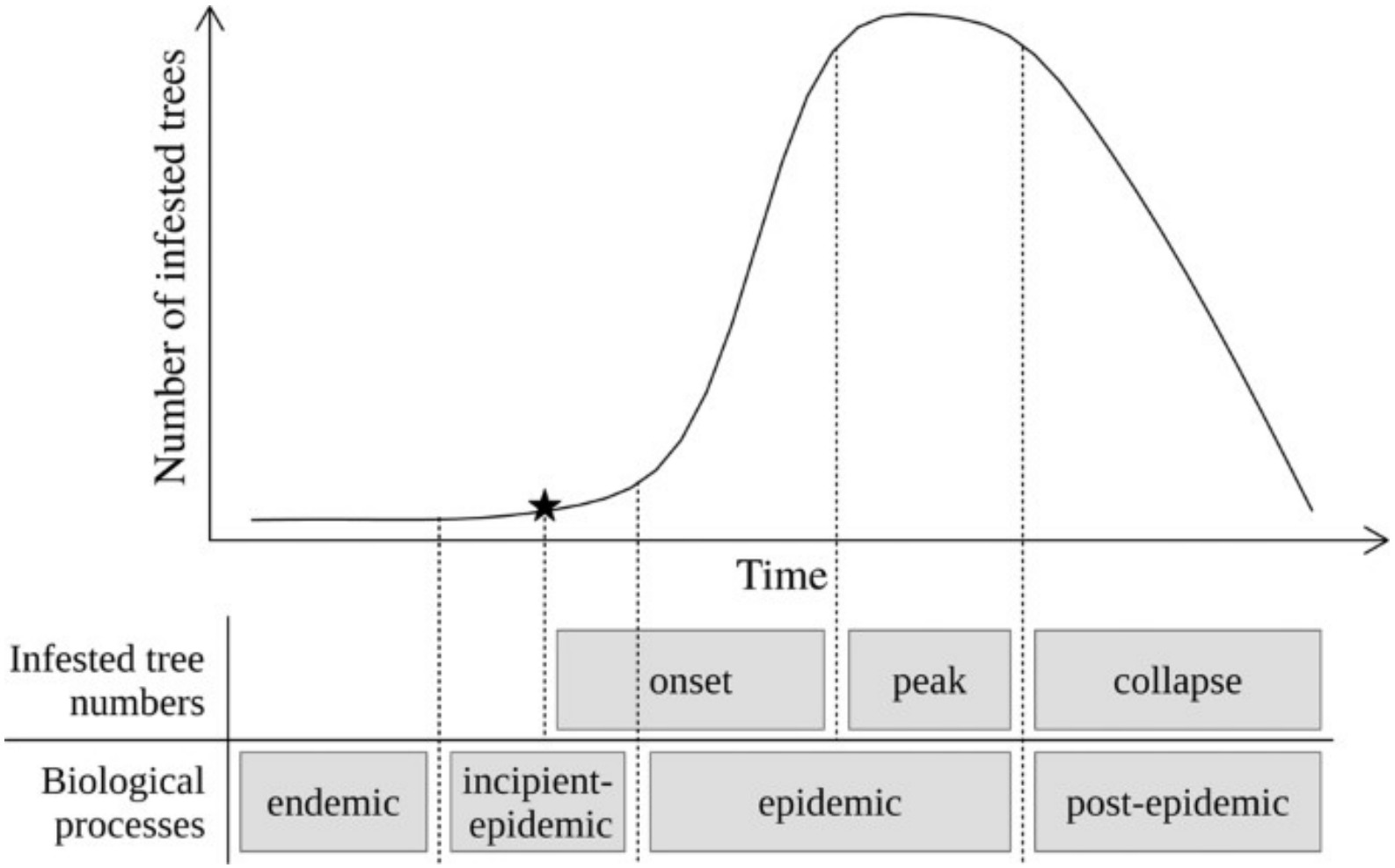


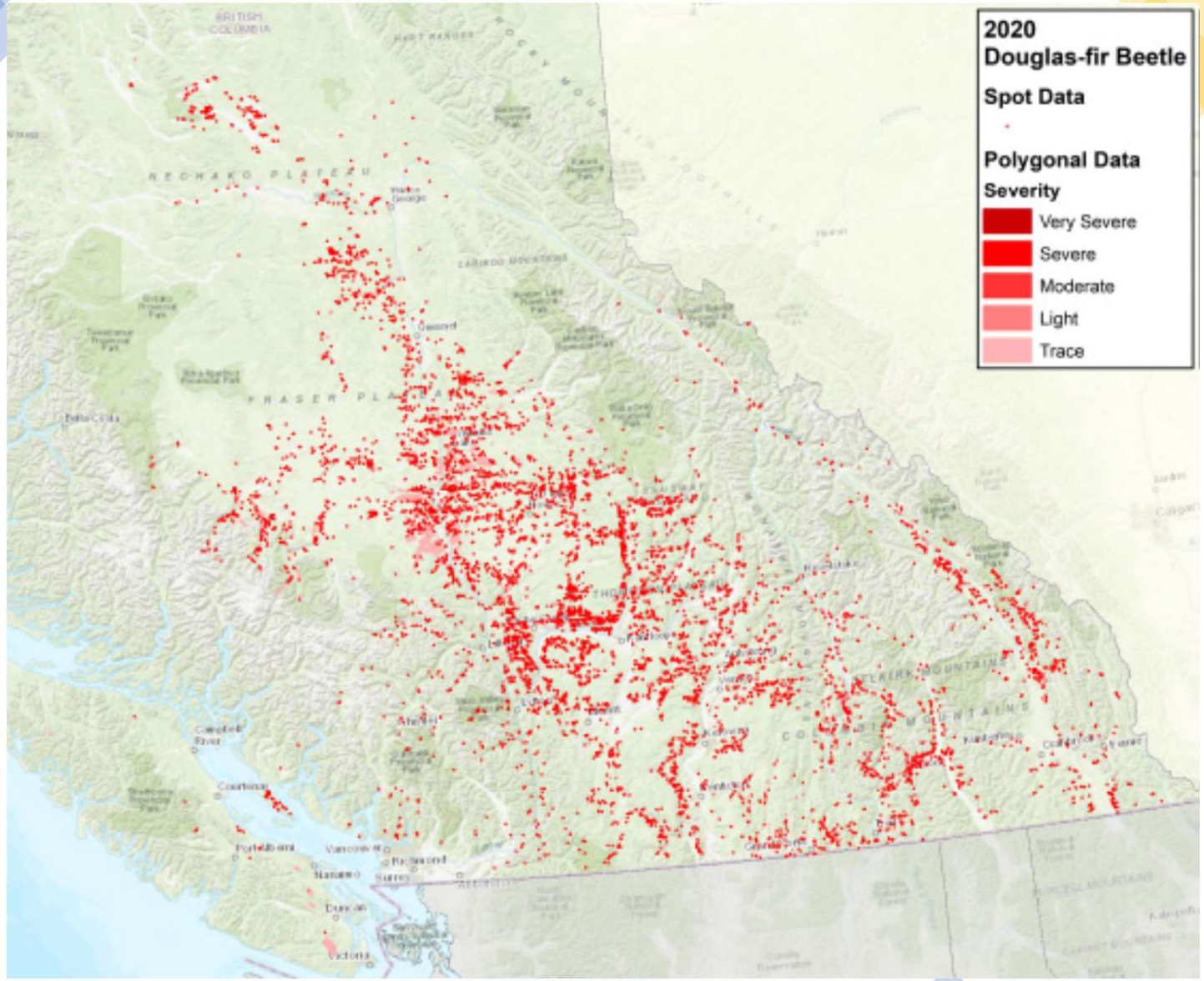
- Western balsam BB IBB Bl (Ba, Sx)



- Periodically reach outbreak levels in BC
- Will kill large numbers of large diameter, mature and overmature trees

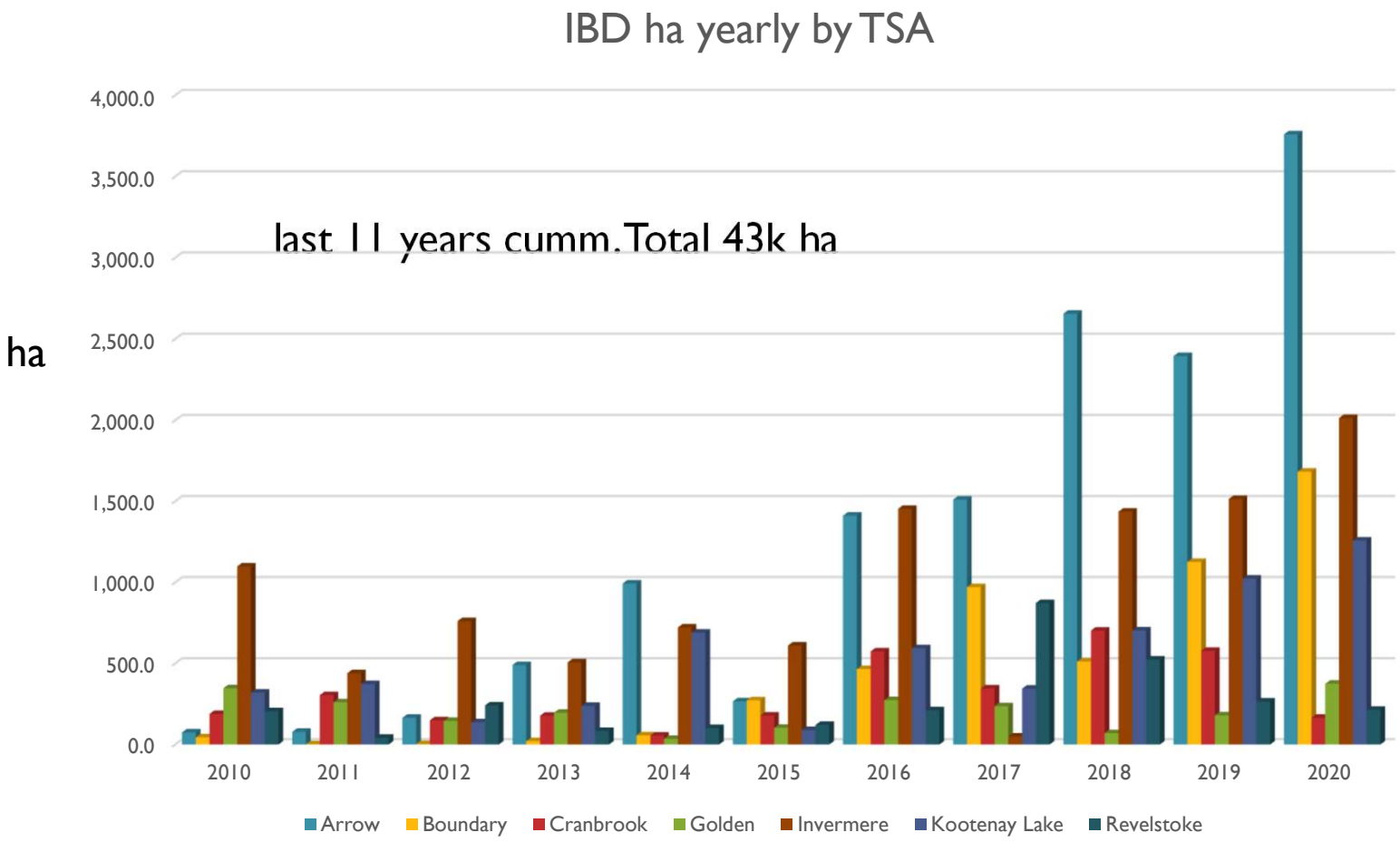
Bark beetle outbreak dynamics





98,497 ha 2020

Historical trends & current issues
Douglas-fir Beetle



- Most emerging issue (drought, fires, wind events, and constraints)
- 11 year total ha: Arrow 13k and Invermere 10k

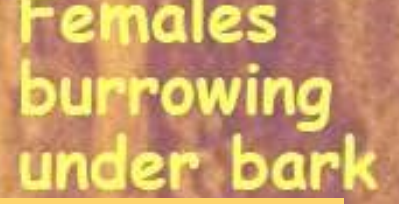
Douglas-fir Host Selection

- Prefers mature/ overmature(>20cm DBH), weakened and downed host material (Fd; occasionally Lw)
- Stress factors such as;
  - Fire
  - Drought
  - Root disease
  - Defoliation
  - Injury (windthrow, snow snapped, salt damage, mechanical damage, etc.)
- IBD populations are high/ increasing in the Kootenay Boundary Region. Cumulative result of blowdown, fires, drought, and forest characteristics over last decade





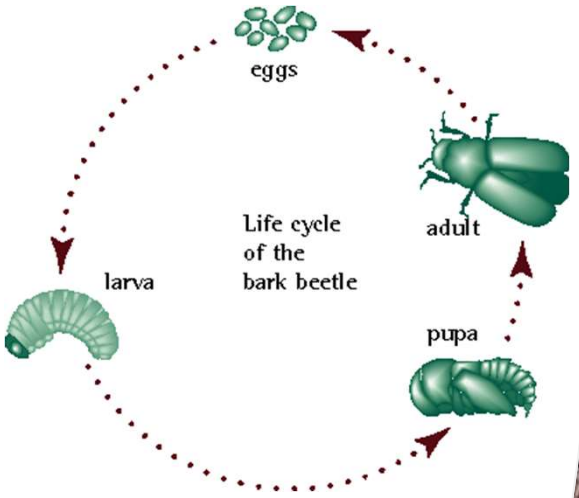

PHLOEM FEEDERS



- Create egg galleries in inner bark=phloem
- Require fresh, moist phloem
- Trees that have been dead for more than one year NOT suitable habitat

- Trees damaged by FIRE or DROUGHT sometimes attractive longer – not killed by stress event

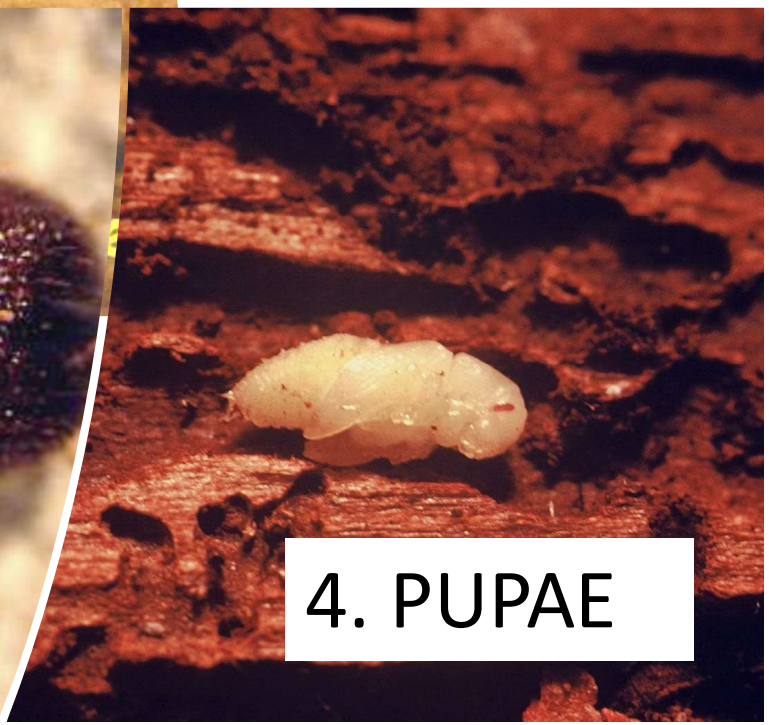
General Bark Beetle Life cycle



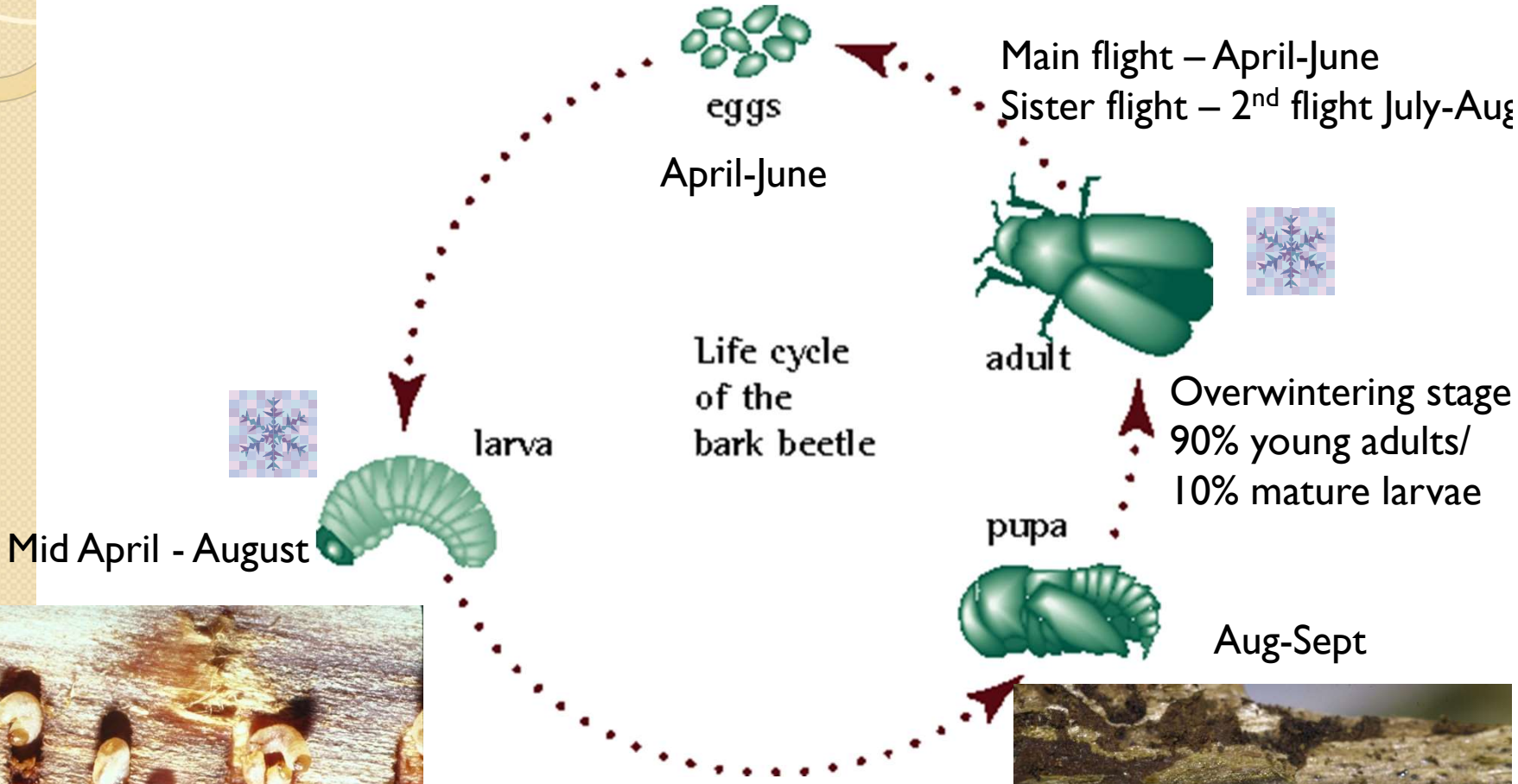








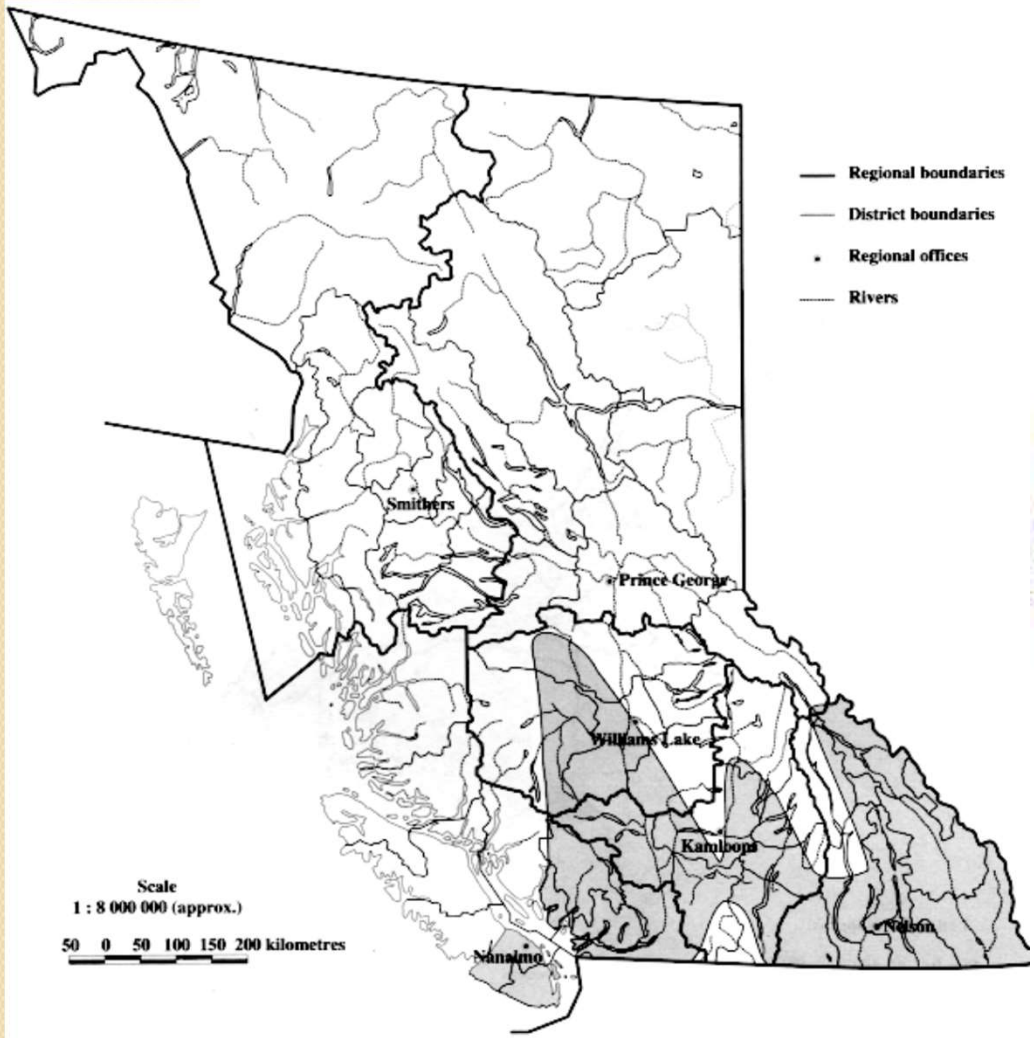
LIFE CYCLE (4 stages) IBD







IBD and Douglas-fir distribution in BC



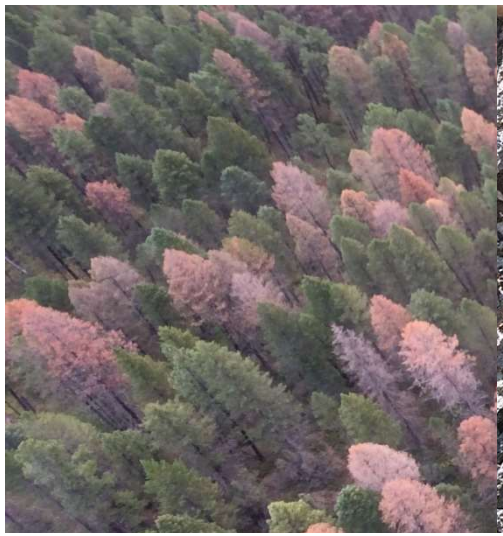


IBD Symptoms of attack

1. Crowns symptoms
2. Orange boring frass
3. Fresh streaming resin
4. Pouch fungus
5. Galleries
6. Secondary insects



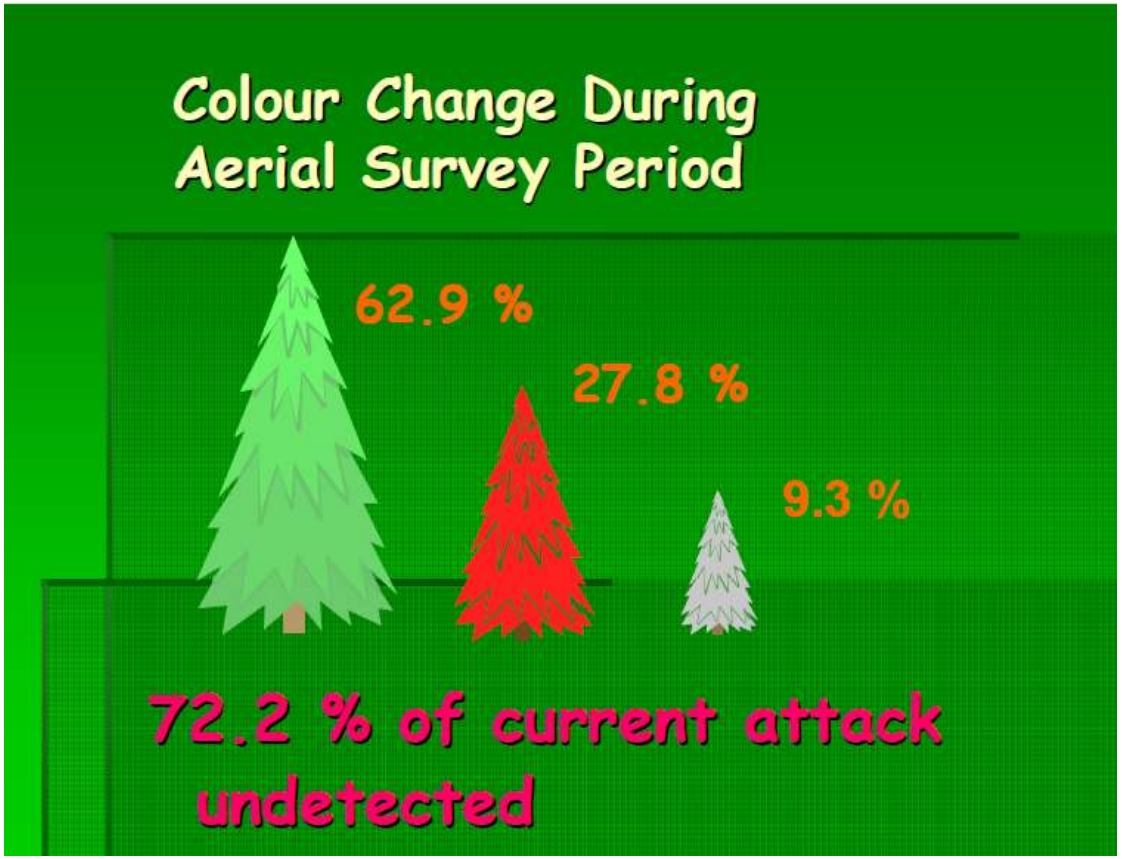








1. IBD: Crown symptoms

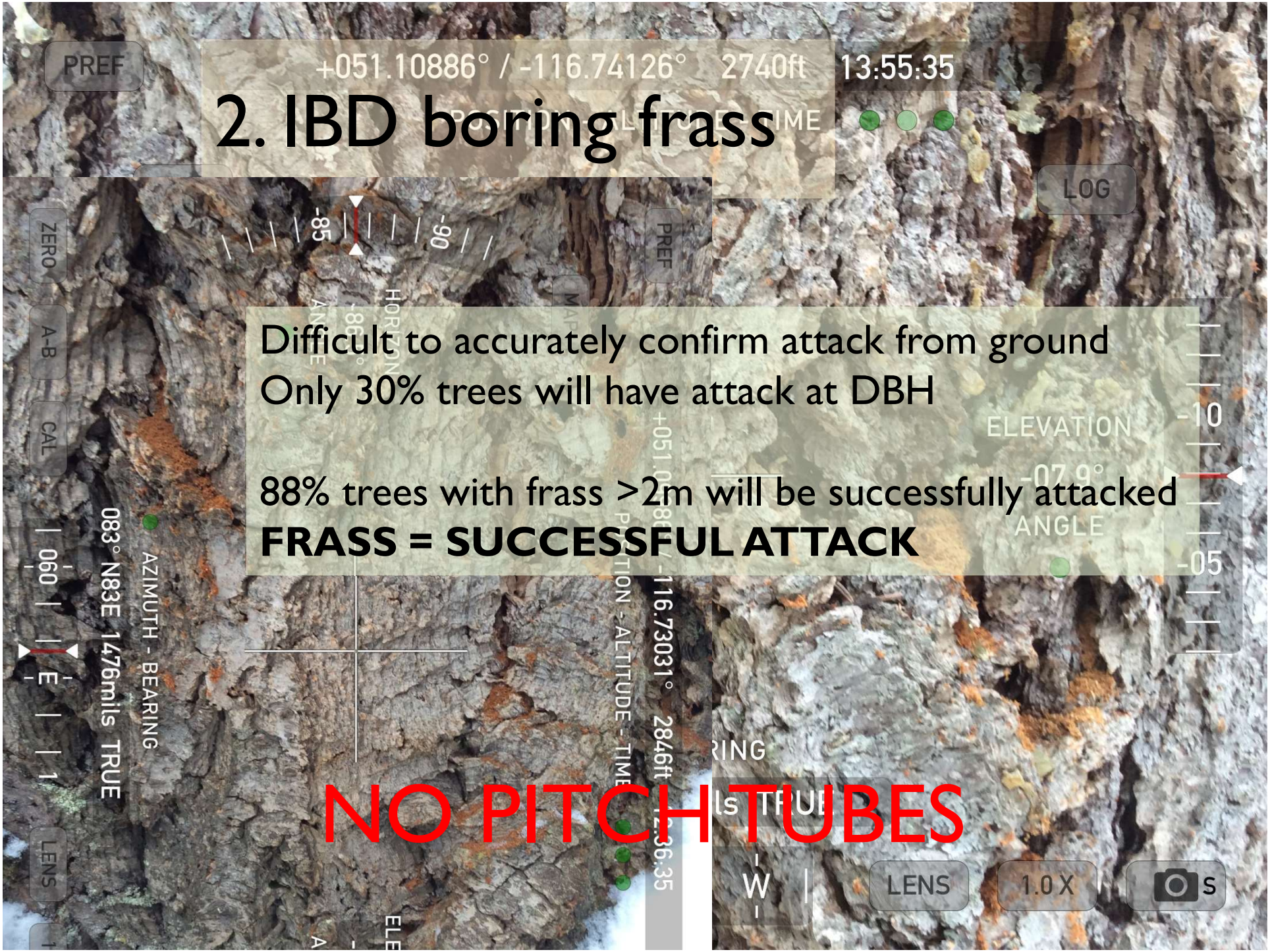


- GREEN – YELLOW – RED –GREY
- Variable color change; gradual or rapid
- Never assume red and grey trees have NO beetles, always do under bark checks!



1. IBD crown

- Orange red, greys



2. IBD boring frass

Difficult to accurately confirm attack from ground
Only 30% trees will have attack at DBH

88% trees with frass >2m will be successfully attacked
FRASS = SUCCESSFUL ATTACK

NO PITCH TUBES



3. IBD: Streaming resin

- trees mainline of defence: resin flow to drown the attacking beetles
- many causes
- no pitch tubes
- Pitch streams & No frass =

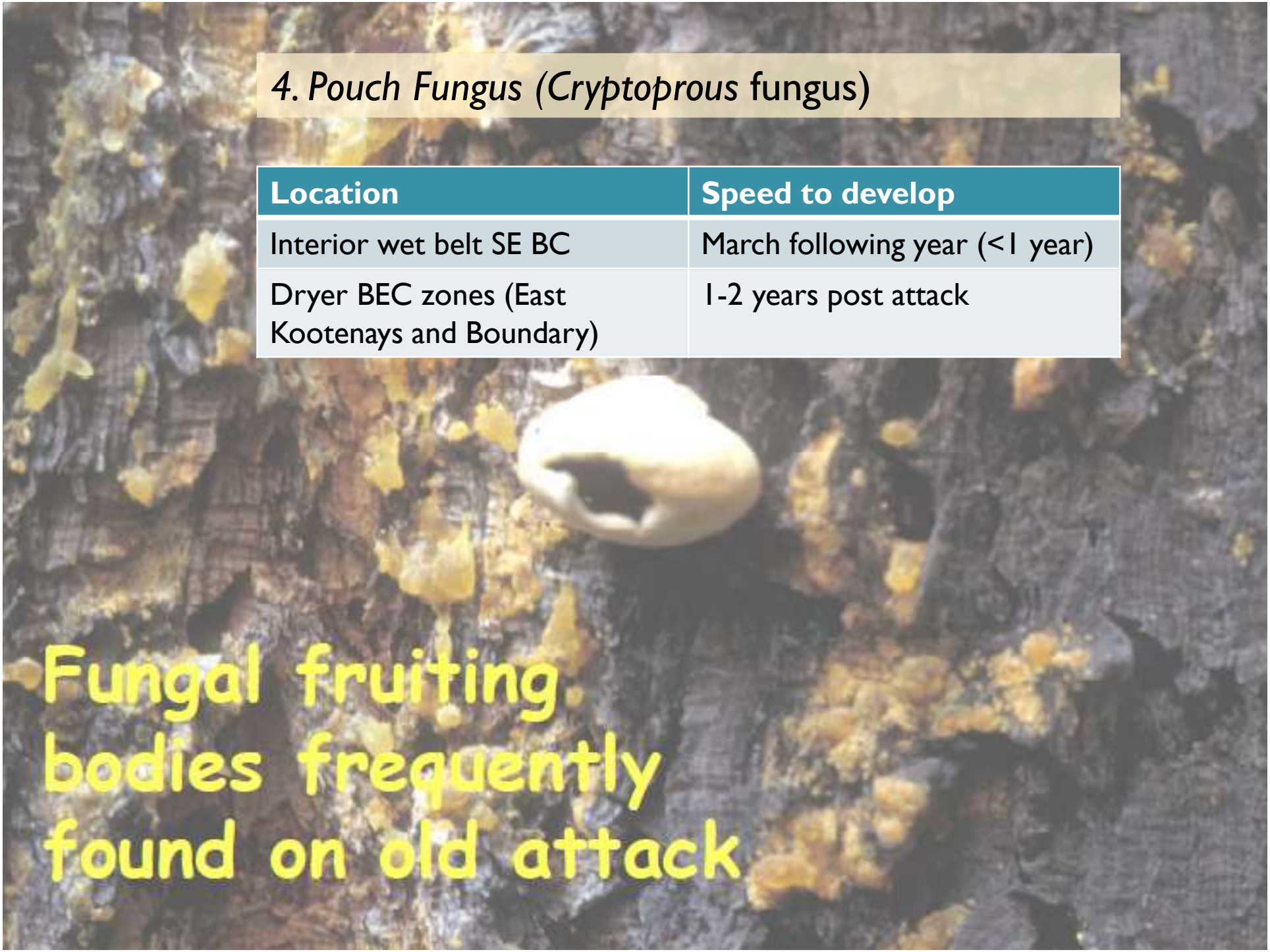
3. IBD Streaming resin





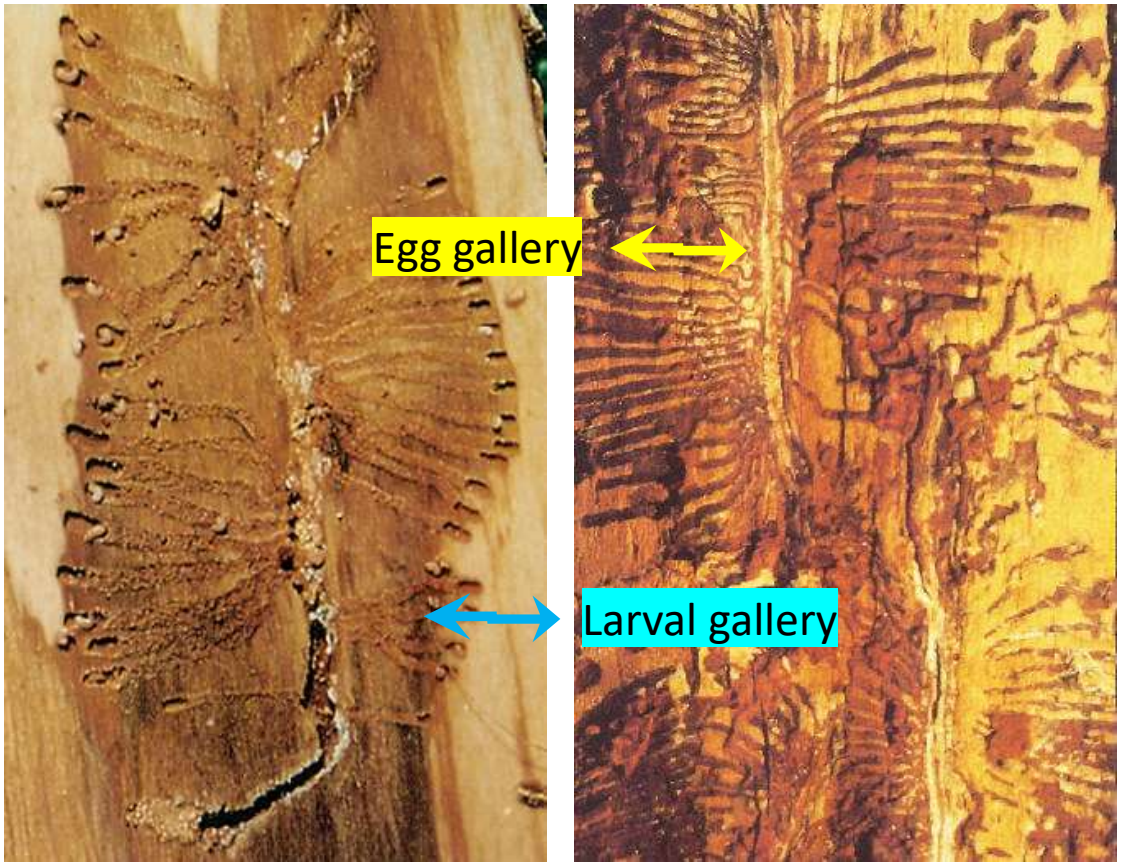
4. Pouch Fungus (Cryptoprous fungus)

Location	Speed to develop
Interior wet belt SE BC	March following year (<1 year)
Dryer BEC zones (East Kootenays and Boundary)	1-2 years post attack





5. Galleries: IBD



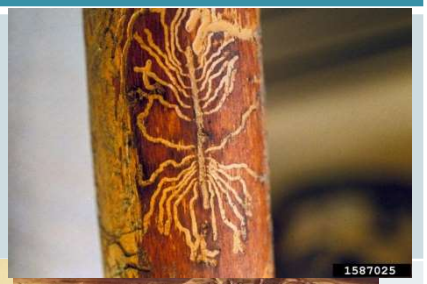
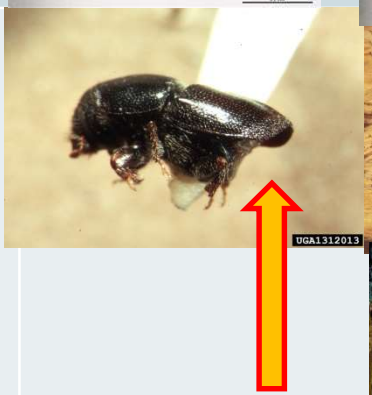
- Bottom hook on gallery
- 20-25 cm long
- Alternate **fan shaped** groups
- Packed with boring frass

- Egg gallery –vertical

- Larval galleries - horizontal

6. Secondary Insects: Bark Beetles

With IBD: 1-2 generations/ year

Insect	Scientific Name	Habitat	Characteristic	Adult/ Gallery
Douglas-fir pole beetle	*Psudohylesinus nebulosus*	Small diameter Fd, or tops etc.	Adults: dense scales 3mm long round posterior	 
Engraver beetle	*Scolytus tsugae*	Small diameter Fd, or tops etc.	Adults: sawed off posterior G: defined nuptial chamber; egg gallery horizontal, larval galleries vertical	  

6. 2nd insects: Woodborers

- Flatheaded
- Rounded headed
- Wasp wasps

Metallic beetles

Long horn beetles






Long horn beetles


Metallic beetles


Wood wasps


Round heads


D shaped head


Pointed, dark tip


Round holes


D shaped holes

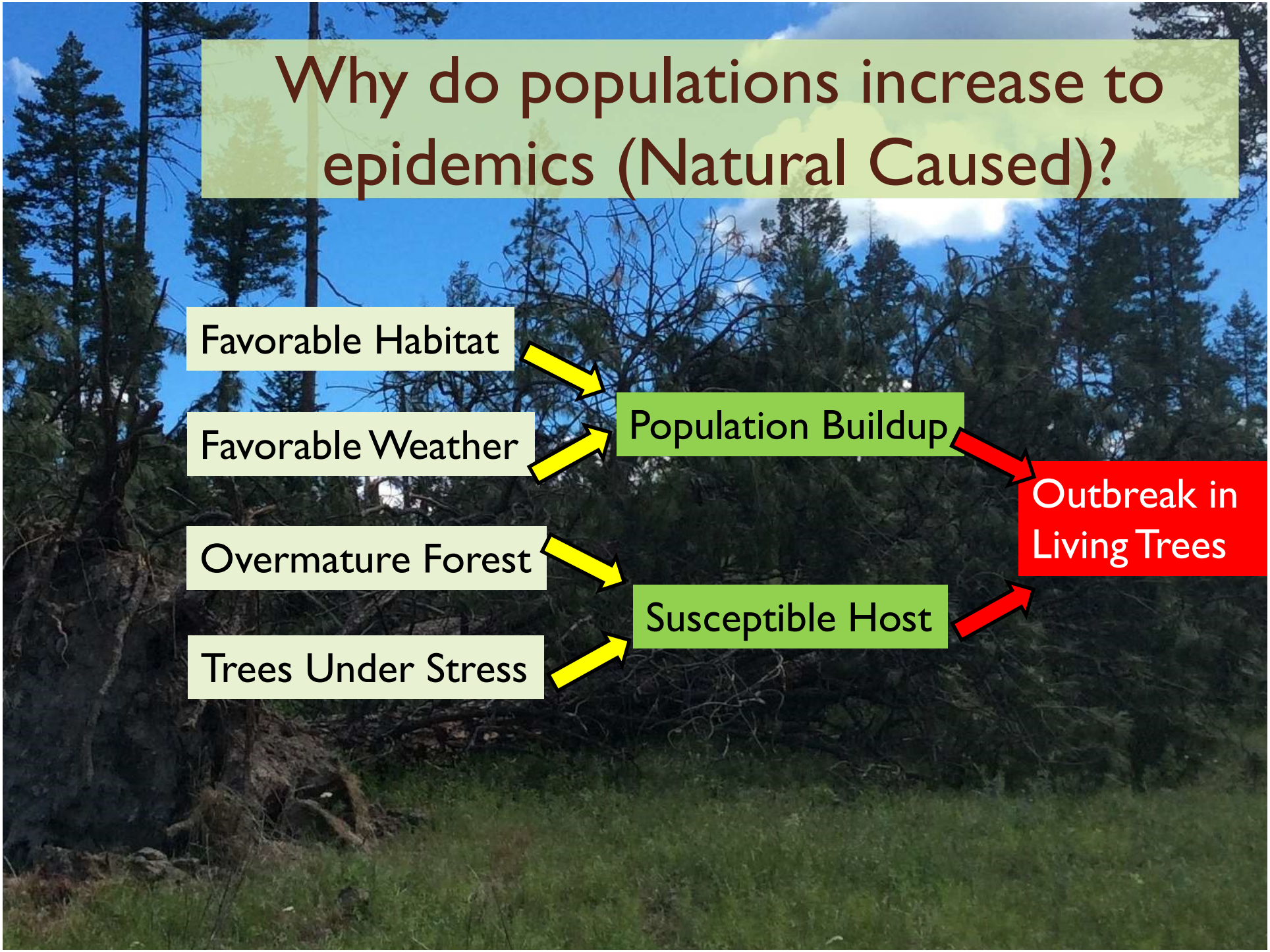

Frass packed to side



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Management Strategy Criteria

- Depend on;
  - Infestation size
  - Stand susceptibility
  - Values at risk
  - Access to infestations
  - Infestation history


Why do populations increase to epidemics (Natural Caused)?
Favorable Habitat
Favorable Weather
Overmature Forest
Trees Under Stress
Population Buildup
Susceptible Host
Outbreak in Living Trees


Date & Time: Tue Aug 7 08:53:24 MDT 2018
Position: 11 N 585404 5557920
Altitude: 1133m
Datum: WGS-84
Azimuth/Bearing: 353° N07W 6276mils (True)
Elevation Angle: -01.4°
Horizon Angle: -00.0°
Zoom: 2X
drm detailed aerial drought
Trees under stress:
DROUGHT

FIRE AND IBD ATTACK

None

Some

Lots

- Classification of burned areas
  - **<u>Black</u>**: tree boles completely charred and blackened, foliage destroyed, and understory vegetation burned. ***No IBD***
  - **<u>Black/brown</u>**: mostly black but some brown foliage.
  - ***May develop IBD***
  - **<u>Mixed green/brown/black</u>**: mostly green foliage, with brown and black spots, understory variously burned. ***Sig. beetles may develop.***



NATURAL CONTROL



- Beneficial insect like parasites and predators (checkered beetles= clerids) kill larvae and adults



Why do populations increase to epidemics (Human Caused)?

- Abandoned log decks
- Large debris (either green or with beetles)
- Unburned slash piles
- Right of way/roads
  - Damaged/buried roots
  - Windthrow
  - High stumps/ Stubs
  - Basal scars
  - Salt damage

IBD Management Treatments

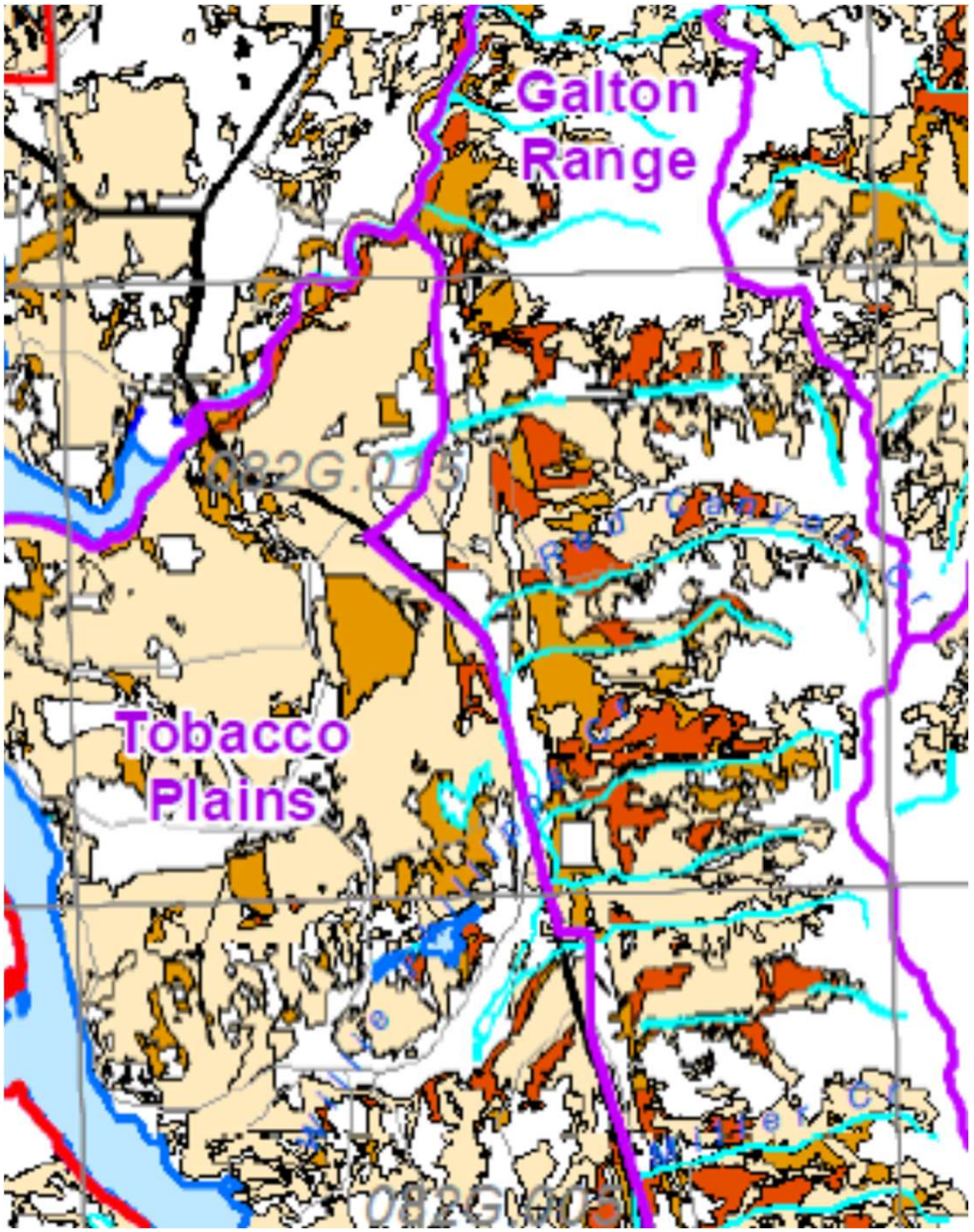
Proactive:

- **High hazard host removal** – take trees out before beetles get to them

Reactive:

1. **Sanitation and salvage harvesting**
2. **Trap trees**
3. **Funnel trapping**
4. **Anti-aggregant MCH**
5. **Single tree treatment**

Proactive: High hazard host removal



1. Sanitation Harvesting

- **Most effective tactic, especially with trap trees**
- Remove all currently infested trees & mill before beetle flight



1. Low stumps <30cm
2. Clean logging
3. Debris pile management

1. Sanitation Harvesting



- High infestation levels make this more difficult
- Permits may need to be expedited
- Blanket scale permit?
- Avoid damage of residual trees



1. Salvage harvest

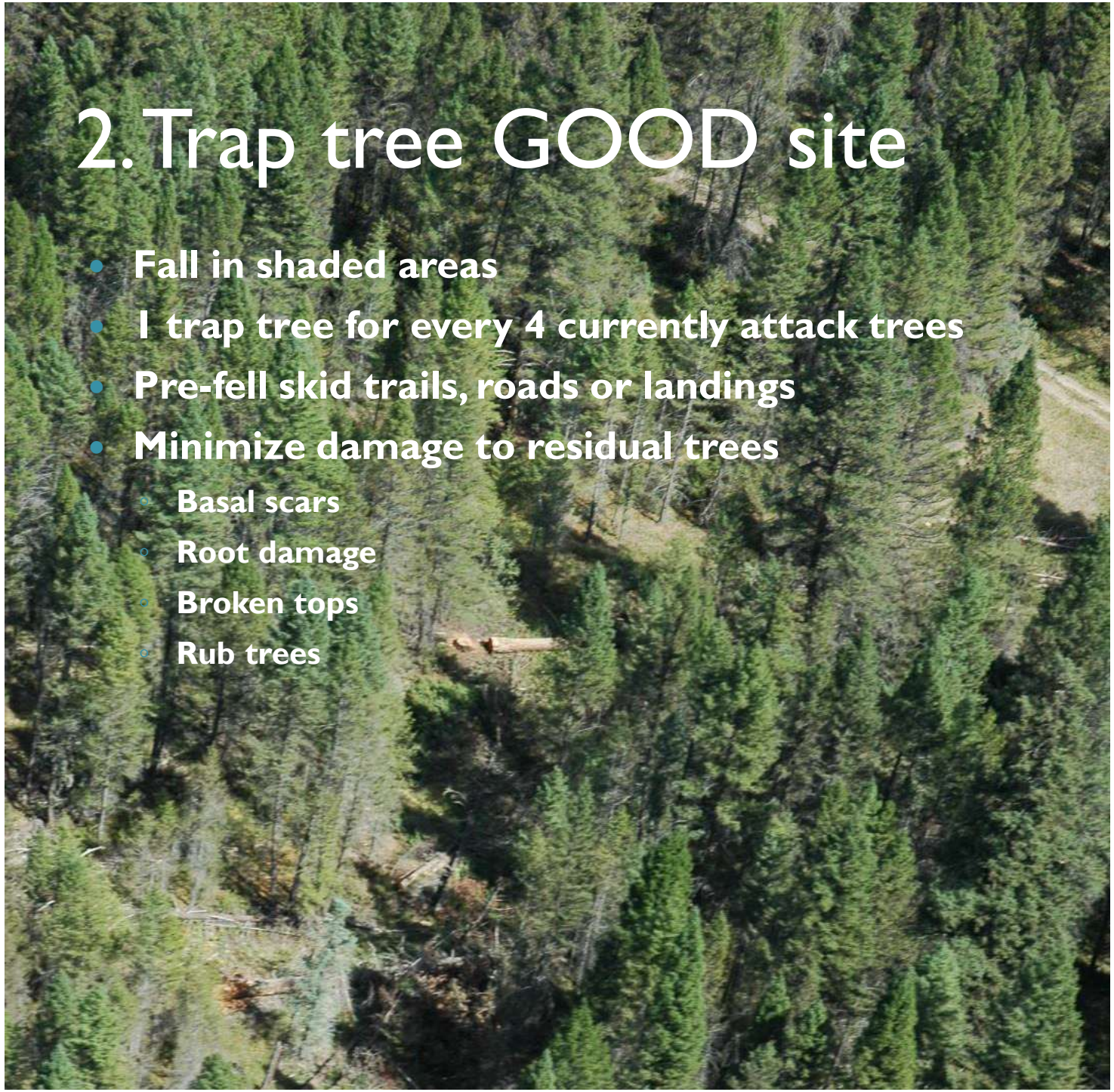
- Recover value
- Denim wood

2. Trap trees

- Place fall/late winter (before April 1)
- Choose larger trees (>30cm DBH)
- Into SHADE, min. opening size
- Remove before next beetle flight (late summer-early fall)
- Can leave green log decks over beetle flight to act as trap trees

- In chronic areas, grid groups of trap trees 400-600m intervals
- Leave unlimbed or unbucked (min. drying)
- Ground survey sites check for spill over attack

2. Trap tree GOOD site



- Fall in shaded areas
- 1 trap tree for every 4 currently attack trees
- Pre-fell skid trails, roads or landings
- Minimize damage to residual trees
  - Basal scars
  - Root damage
  - Broken tops
  - Rub trees



2. Trap tree POOR site

- Exposed to direct sun
- Too hot and dry
- No attack on top of log in exposed sites – don't catch as many beetles



2. Trap tree - POOR

- Avoid contact with standing trees. Touching standing trees results in overflow attack.



2. Trap Trees

- Keep stumps as low as possible
- Maximum stump height 30cm
- Peel stumps or use MCH

Pheromones (3 main uses)

1. *Grid/spot baiting* - aggregation pheromones to contain and concentrate populations prior to harvesting
2. *Trapping* to monitor or suppress populations
3. *Anti-aggregants* (MCH) deter attack

https://semiochemical.com/wp-content/uploads/2017/03/Tree-bait-bulletin.pdf

Pheromones

- Release rate is temperature dependent; warmer air=higher release rate (N side)
- Wind speed and direction determines where the pheromone plume will go.
- Insects can only 'sense' these chemicals from a downwind position.
- Use wind to your advantage



3. Trapping - Baited Funnel Traps

- **PROS**
- Don't become saturated like trap trees/ baited trees = unlimited capacity
- Fully infested TT or baited trees can become source of anti-aggregation – spill over attack
- TT/ Baited trees – females can re-emerge = SISTER flight – can't in funnel traps
- No disposal of infested trees
- For ever 1,700 beetles caught = save a tree



- **CONS**
- Capital cost to purchase
- High risk of spill-over attack to standing trees if placed too near (within 100m)
- High maintenance (bears, wind, cows, hunters)
- High labour to monitor and maintain (traps must be checked & emptied regularly)
- Also catch predators (clerids)
- Vapona
- Bycatch potential - bats

4. Anti-aggregant MCH



- MCH (Methylcyclohexenone)

- Tells beetles tree = full, go away
- No vacancy sign
- Repels and disperses beetles – die searching
- Use for high-value trees
- Protects healthy standing and uninfested windthrow
- Timing & population levels important
- Benefits: one entry, fairly cheap to buy

4. MCH

- Works best small infestations (avoid larger sites - may be ineffective or risky)
- Treat sites after sanitation harvesting to disperse beetles in stumps, debris, tops, etc.
- Protects damaged or stressed residual trees.
- Place on healthy Fd trees within 100m of baited funnel traps.

- Place on north side, as high as possible, at 10x10m spacing
- To protect individual trees – 2 bubble caps (opposite sides)



5. Singe tree treatments





Thanks