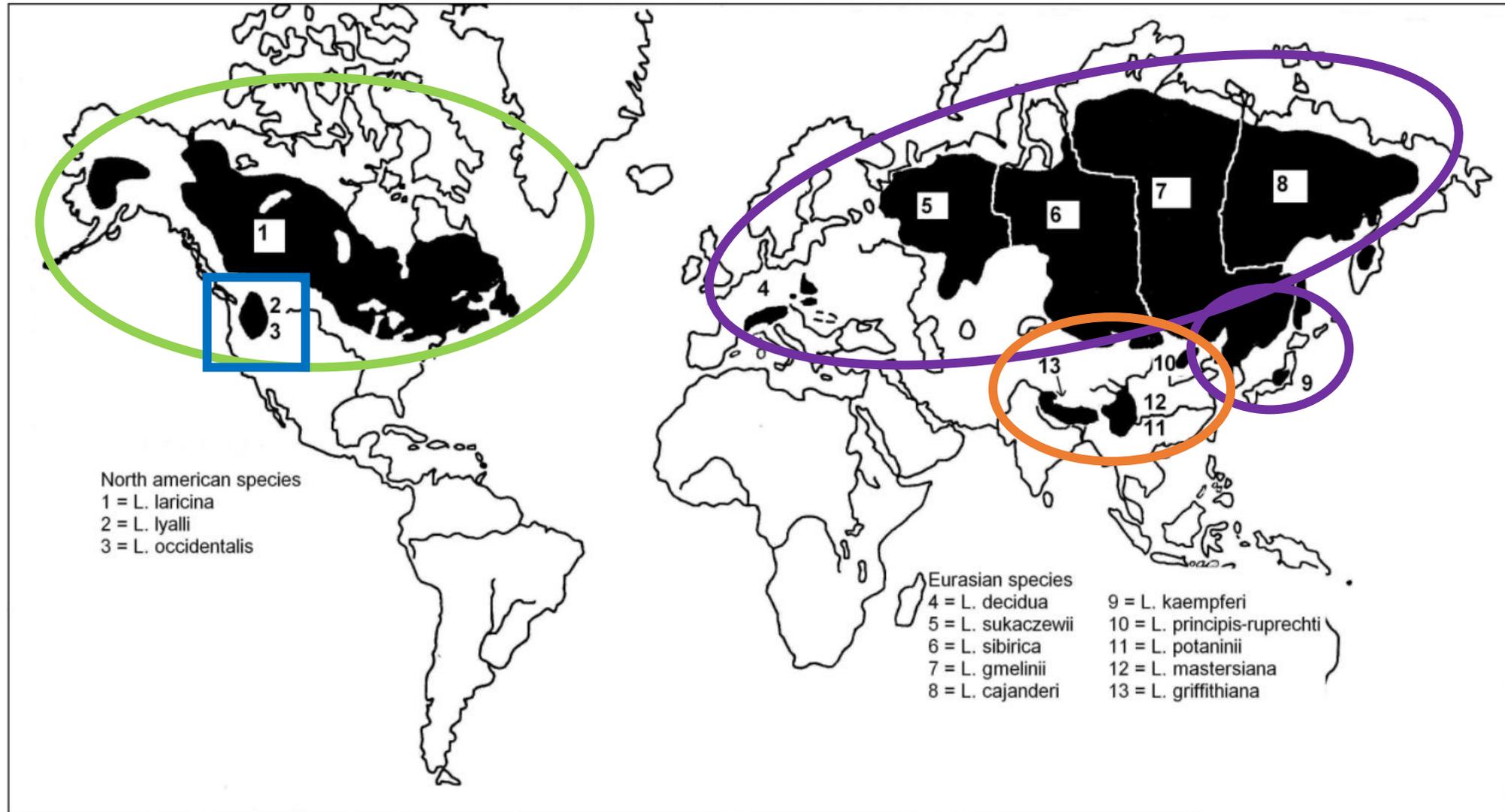




LARCH – CURRENT AND FUTURE POTENTIAL



The worldwide distribution of the genus *Larix* (map from Schmidt 1995).





LARCH - Quick facts

- deciduous conifers in the genus *Larix*
- 20-45 meters tall
- ~ 10 species
- 1-1.5 m in diameter
- 2-5 cm long needles
- Cones:
 - Female* - 1-9 cm long, purple or green, becoming brown when they ripen
 - Male* - Orange-yellowish, fall after pollination
- Seeds: winged

What species of larch do we have in Sweden?

Occur in planted stands in Scandinavia:

- Japanese larch (*Larix kaempferi* (Lamb.) Carr.)
- Siberian larch (*L. sibirica* Ledeb. and *L. sukaczewii* Djl.)
- Hybrid larch (*L. × eurolepis* Henry)
- European larch (*L. decidua* Mill.)



Japanese larch

- reaches a height of 30-40 m
- the needles are 1.5-3.5 cm long, soft, glaucous-green, turning golden-yellow in autumn
- seed of Japanese larch matures earlier in spring than that of European larch



L. kaempferi tree (L), foliage (LC), female cones (C), cultivar 'Pendula' (RC) and branches of cultivar 'Diane' (R).

Siberian larch

- one of the hardest softwoods in the world
- heights between 20 and 50m
- needle-like leaves
- with a 1m trunk diameter
- grows extremely slowly



L. siberica foliage (L)
and female cone (C), *L.*
siberica tree (U).

Hybrid larch



Lifespan: 300 years

Height: up to 40 metres

Leaves: needles grow in rosettes on short shoots.

Seeds: Red-purple female flowers form cylindrical cones with round scales, many of which turn outwards.

Uses: Its strong durable timber is used for fencing, rails and gates.

European larch

- height up to 45 m
- lifespan of 600-800 years
- seed cones persist in the plant for up to 10 years
- seeds are 4-5 mm long



Leaves are produced on both short shoots (spurs) and long shoots (L), with clusters of needles along the stems (LC and RC). The fallen leaves from a soft mulch (R)



The needles emerge in dense clusters from the spurs in early spring (L), elongating and darkening as they grow (C and R).



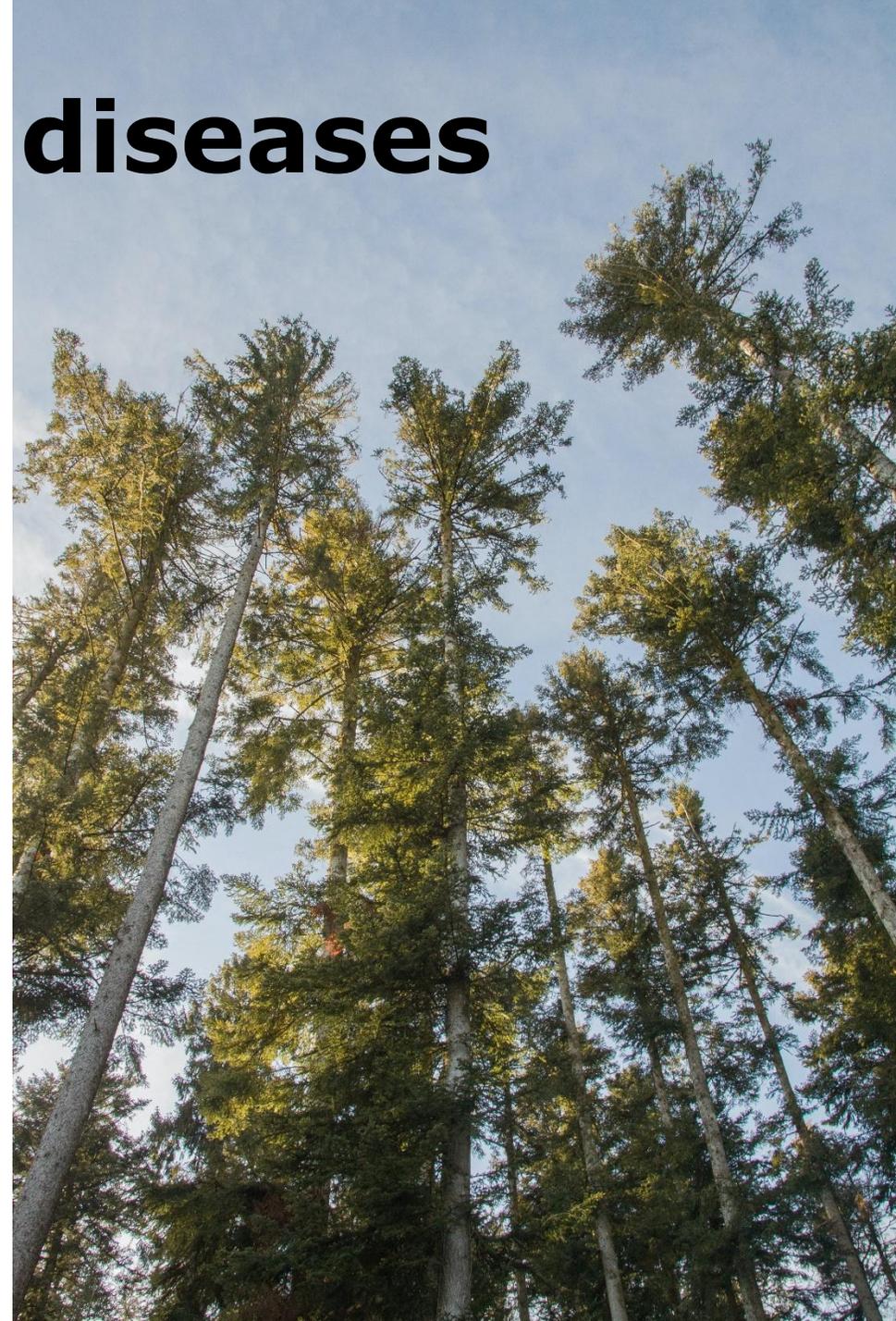
The male cones begin to develop in early spring (L, top), elongating (L, bottom) to release pollen (LC). A young female cone starts out bright red (C) and becomes duller in color (RC, with male cones) and plumper as it ages (R).



Reddish current season and dark older cones persist together (L). The female cones turn brown when mature (LC) and open from fall through winter (RC) to release the seeds (R).

The most known larch diseases

- Larch Needle Blight - *Hypodermella laricis*
- Larch needle cast fungi – *Mycosphaerella laricina* and *Meria laricis*
- Rusts – *Melampsora* and *Melampsorium* spp.
- Sudden larch death - *Phytophthora ramorum*
- European Larch Canker - *Lachnellula willkommii*



SLU ***Hypodermella laricis* - Larch
Needle Blight**

- First described in Central Europe on European larch
- First record in Northern Europe in 2007
- Infection begins in early spring when the leaves appear
- Fruiting bodies appear after needles are killed
- Precipitation is a determining factor for the infection to start
- Mature needles are resistant to infection



Larch needle cast fungi

Mycosphaerella laricina

- *M. laricina* is known to cause a serious loss of productivity, which is also a problem in some forest nurseries



Larch needle cast fungi

Meria laricis



- Only immature needles are susceptible, meaning that later in the season, only needles of the juvenile long shoots and growing current-year seedlings may become infected

Rusts

Pathogenic *Melampsora* and
Melampsorium species



Sudden larch death

Phytophthora ramorum

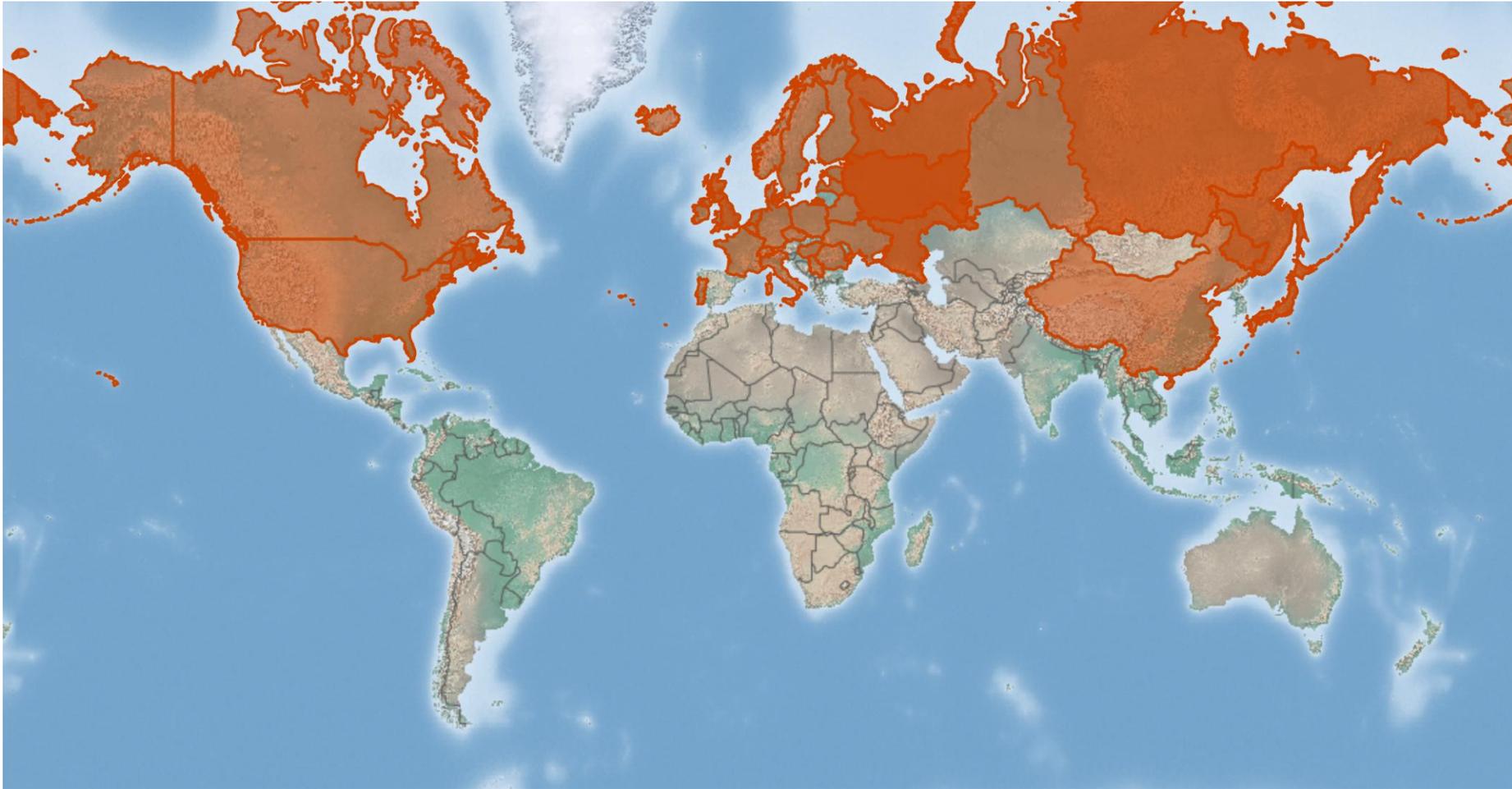
Symptoms include:

- Blackened base of the leaf near the petiole and along the midrib of the leaf.
- Withered and blackened leaves or needles leading to dieback of the outer branches.
- Areas of black “bleeding” on the trunk.

A) death of mature larch trees in Northern Ireland caused by *P. ramorum*; B) crown dieback of Larch caused by *P. ramorum*; C) dead retained needles on Larch caused by *P. ramorum*; D) bleeding lesion on stem of a Larch tree; E) the maroon coloured under-bark



The greatest biological threat to larch - *Lachnellula willkommii*



Distribution of larch canker disease (*Lachnellula willkommii*)

Lachnellula willkommii - diagnosis



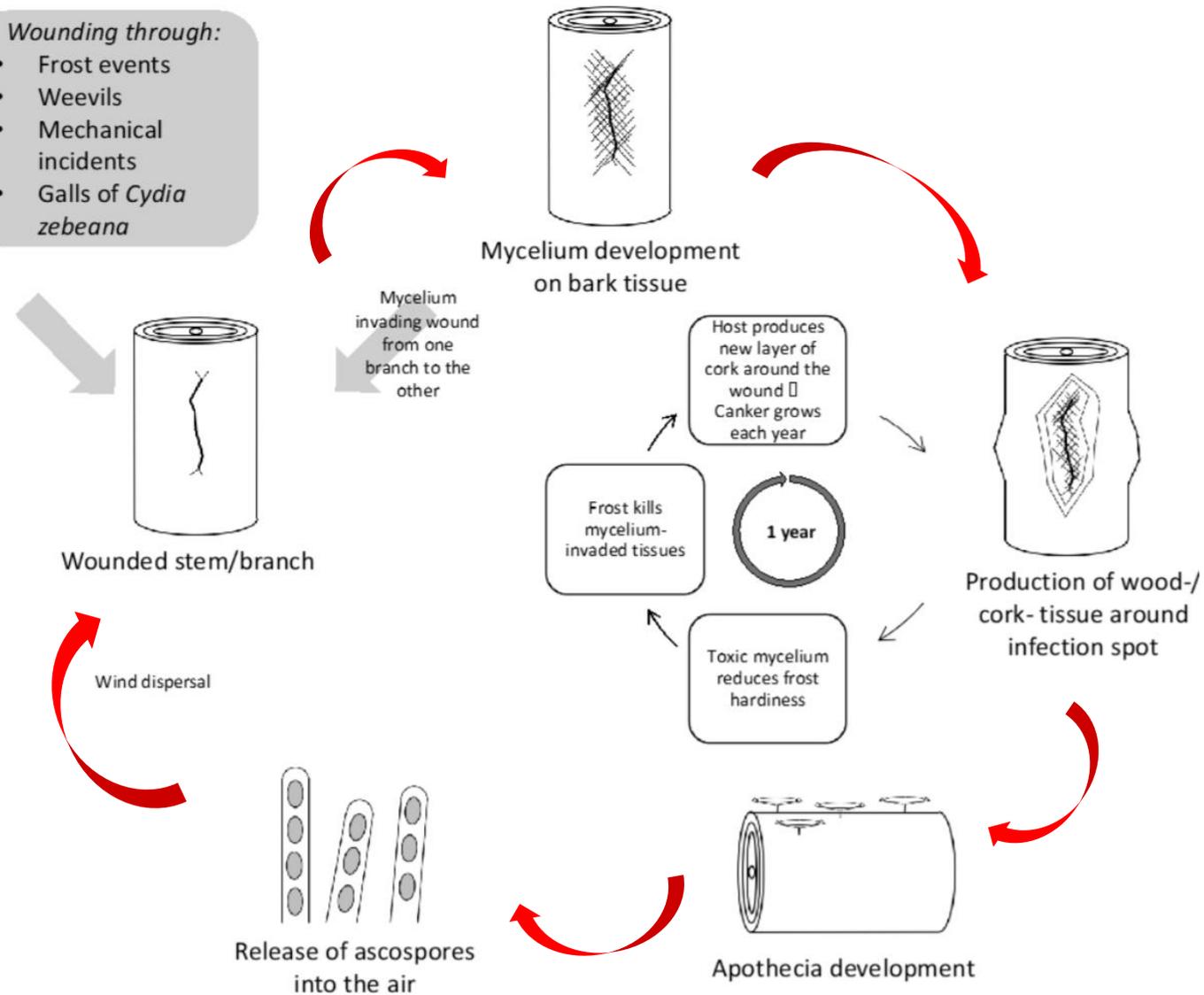
A) Resinous stem canker on European larch infected with *Lachnellula willkommii*; **B)** Swelling and cracking of bark on infected stem; **C)** branch swelling and resinous around lesions; **D)** fruiting of *L. willkommii* on diseased branch; **E)** apothecia (reproductive fruiting body) of *L. willkommii* on European larch.

Lachnellula willkommii - infection biology

Lachnellula spp.



- Wounding through:*
- Frost events
 - Weevils
 - Mechanical incidents
 - Galls of *Cydia zebeana*



Presumed general life cycle of *L. willkommii* (drawn by Erik Kügler)

Lachnellula willkommii - epidemiology



How can breeding contribute to the establishment and wider use of larch in Sweden?



The breeding cycle – the main steps in a breeding programme. Stener et al., 2016

Larch – breeding for resistance





THANK YOU FOR YOUR ATTENTION!