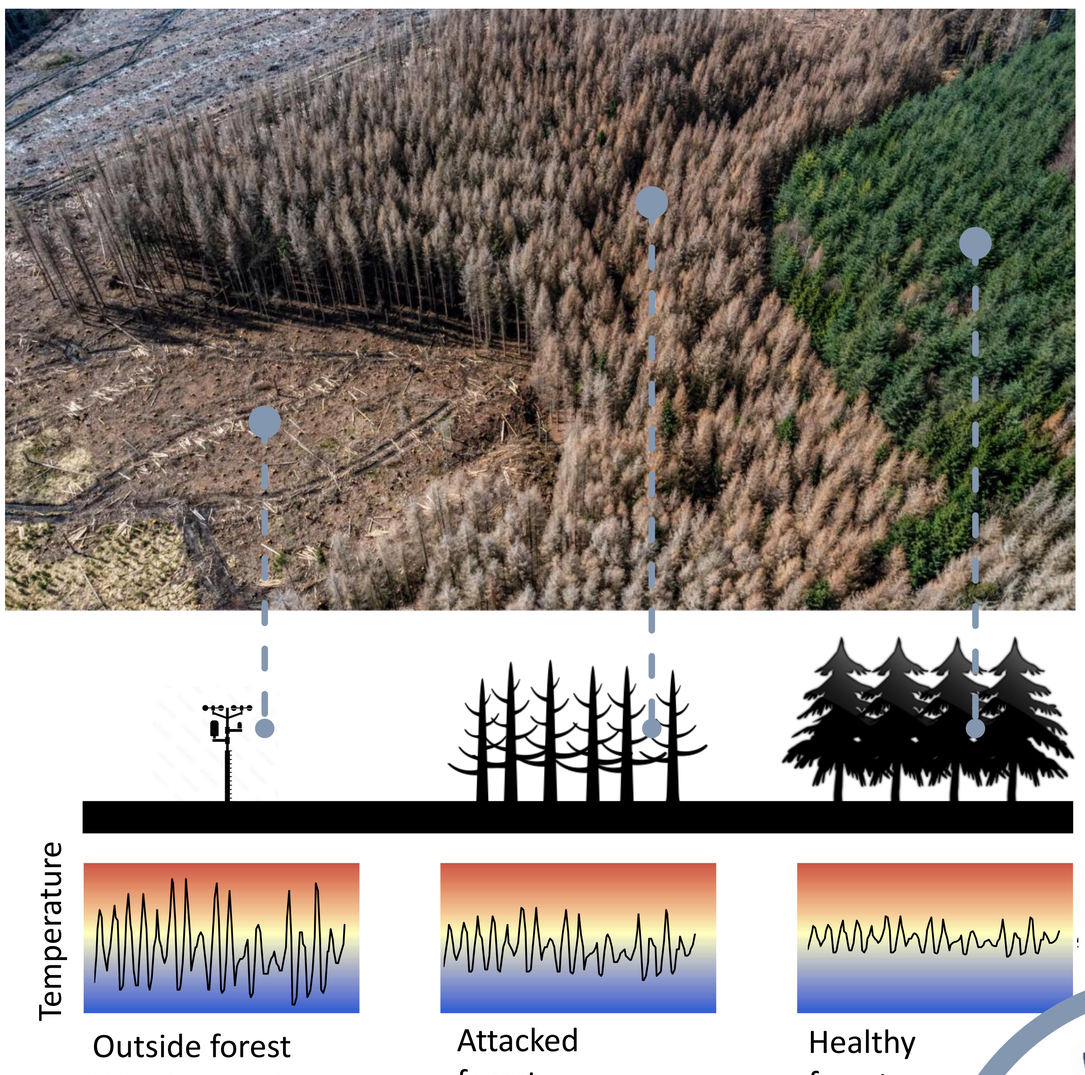
# Bark beetles as climate engineers

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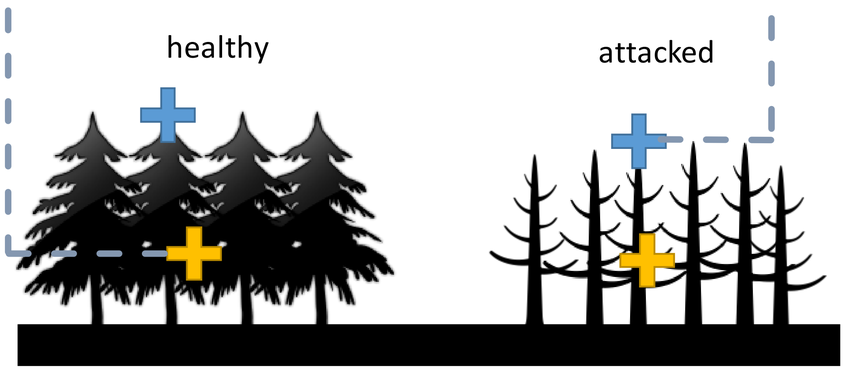
## 1 Bark beetle attacks are increasing potentially changing forest microclimate




## 2 We quantified the impact of bark beetles on microclimate with loggers and drones

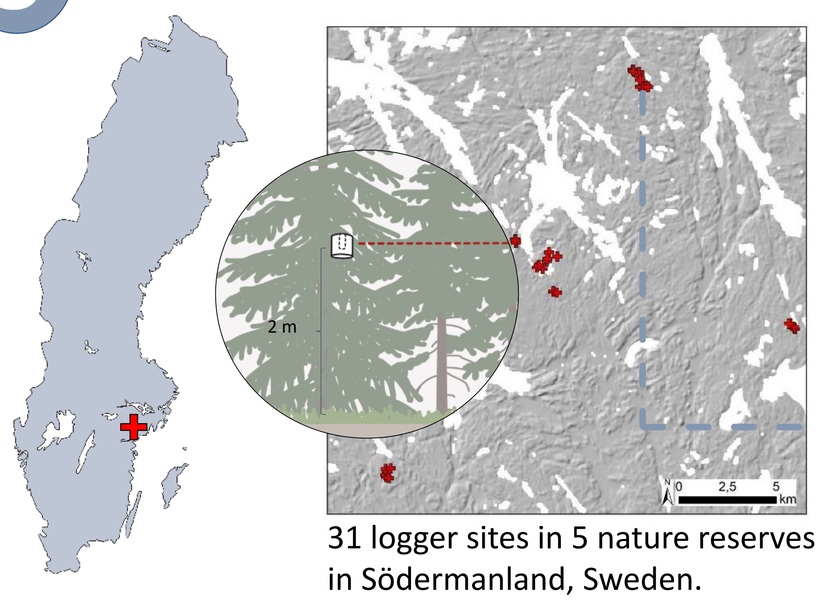
Understory temperature *(Temperature loggers)*

Canopy temperature *(Thermal imagery)*



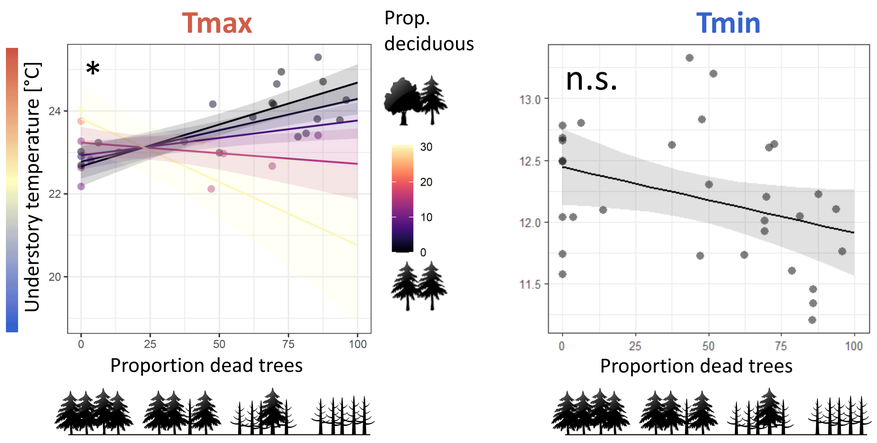



## 3 + Change in *understory* temperature

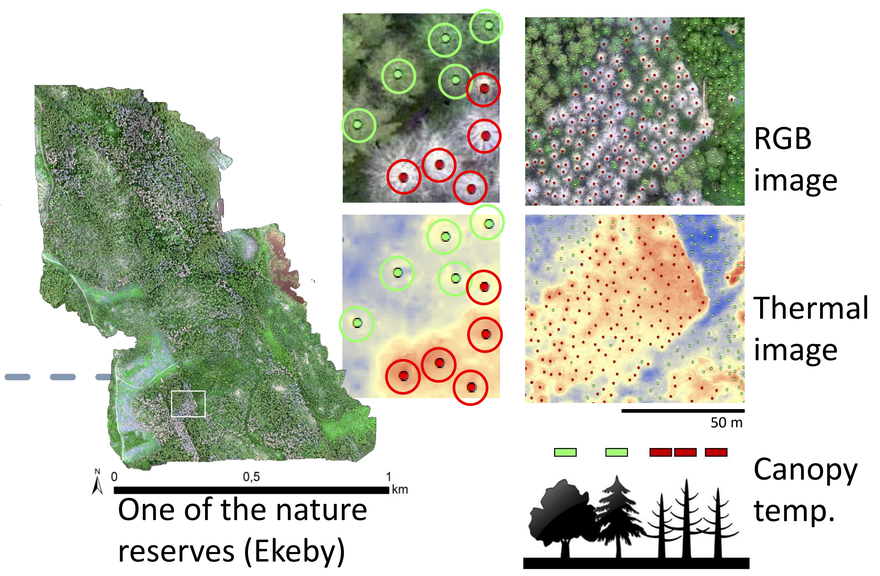



31 logger sites in 5 nature reserves in Södermanland, Sweden.

- More dead trees => warmer Tmax
- Warming effect in attacked stands mitigated by deciduous trees
- No effect on Tmin

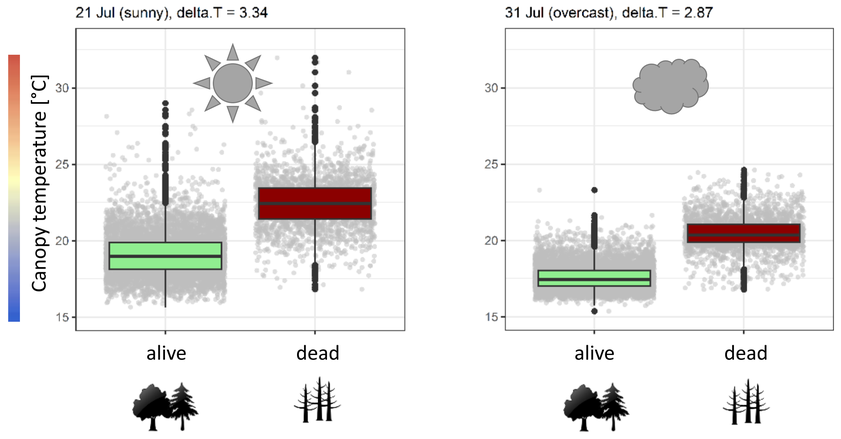



## 4 + Change in *canopy* temperature




One of the nature reserves (Ekeby)

- dead trees ± 3°C warmer than living trees, depending on weather and emissivity estimates




## 5 What does that mean for our forests?

1. Daytime understory and overstory temperatures are warmer in attacked stands

⇒ Feedbacks between climate change, forest management and bark beetles ?

2. Microclimate change mitigated by deciduous trees

⇒ Desprucify and diversify forest?

3. No/little effect on nighttime understory temperatures

⇒ Dead trees still provide shelter from frost … beneficial for biodiversity and regenerating forest?



Photo: Frank Pätz

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