

# Acute Oak Decline - An emerging Decline Disease in the UK.



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# Symptoms of Oak Decline

Reduced tree growth

Crown die-back

Crown thinning, shedding fine twigs, stubby branch ends

Chlorotic leaves, smaller leaves

Loss of foliage along branches, tufts at branch ends

Epicormic leaves / shoots

Stem bleeds

Loss of feeder roots

Fewer root tips

Tyloses









## AOD in UK

- Emerging disease
- Native oak spp. *Q. robur*; *Q. petraea*
- Trees >50-200 yrs
- 1000's affected
- >1% die annually

## External symptoms

- Stem weeping patches
- Bark cracks
- D-shaped exit holes of *Agrilus biguttatus* (1/3)





# Internal symptoms and host responses

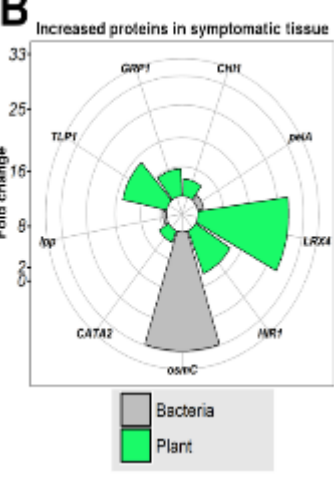
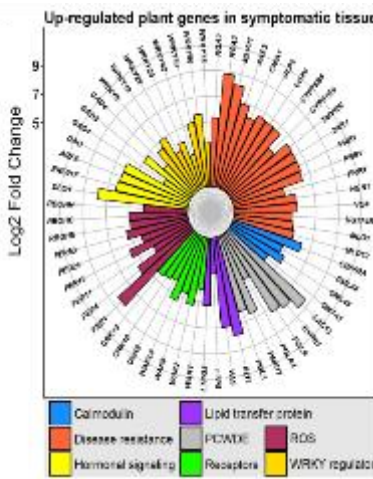
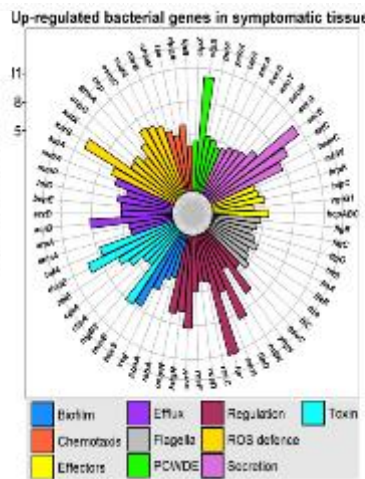
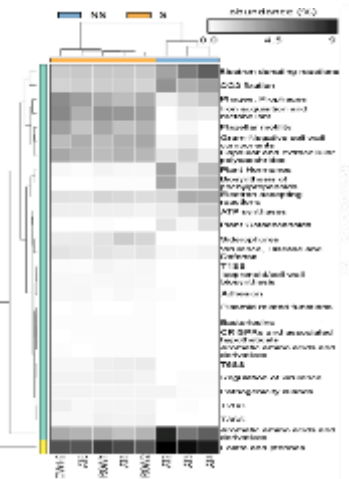
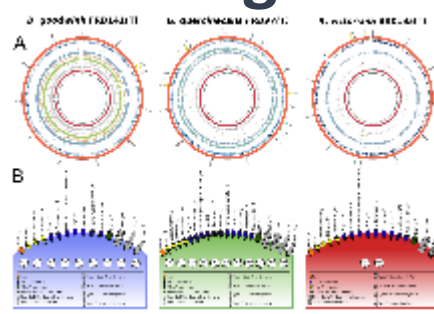
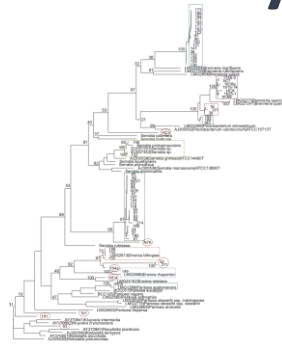


*Agrilus biguttatus* - live bark boring beetle, colonises weakened trees

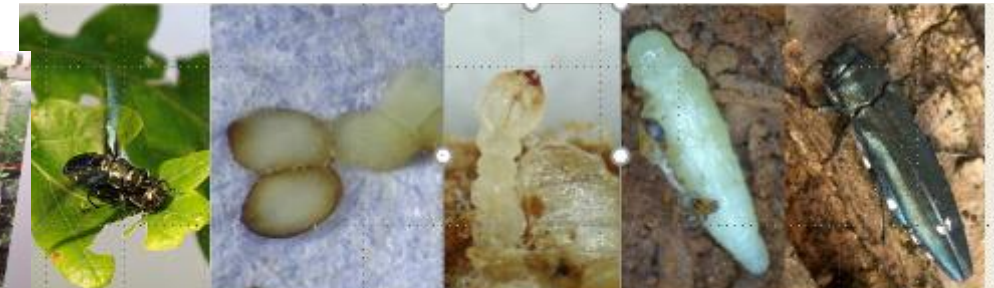


# AOD - 10 years – research on key causal agents

## Distribution: survey and risk mapping



## Beetle rearing in captivity and life cycle biology



- Lesions and live bark maceration caused by bacterial pathobiome dominated by *Brenneria goodwinii*
- Larval galleries of *Agrilus biguttatus* present in all cases
- Distribution of *A. biguttatus* same as AOD
- 10x increase in number and abundance of *B. goodwinii* pathogenicity genes when co-inoculated with *A. biguttatus*

# Association of *Agrilus biguttatus* with AOD is controversial

- Some reports of bacterial cankers no beetle association
  - Depth of galleries!
- Fear of beetle management
  - Native beetle
  - UK Red Data book 1987 - rare and endangered
  - Important food source for woodpeckers
- Ecosystem & biodiversity concerns
- Tension between conservation and forestry - management



Photo credit: Great-Spotted-Woodpecker.jpg (1220x1220) (gardenbird.co.uk)

**Is *Agrilus biguttatus* essential (vs co-incidental) to the development of AOD?  
How do stakeholders feel about management of AOD?**





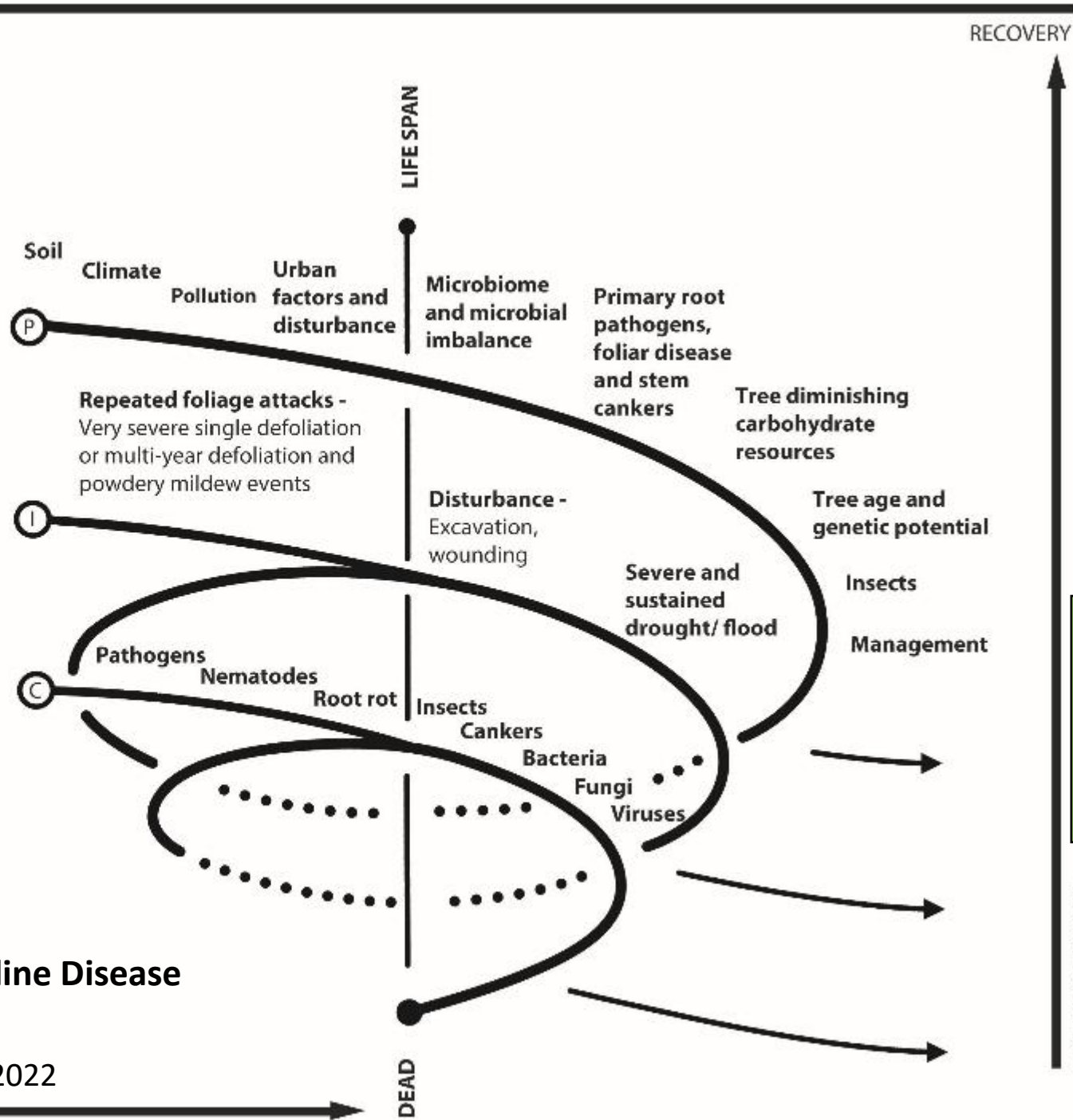
**S T R E S S O R S**

PREDISPOSITION

INCITING

CONTRIBUTING

**Updated Decline Disease Spiral Model**  
Denman et al, 2022



**Involvement of multiple biotic factors and secondary Pest and pathogens – categorised AOD is a Decline disease**

**Which predisposition factors in AOD?**

TIME TO RECOVERY





# Bac-Stop: Overall project objectives

## Overall objectives:

*The overall objective is to **advance knowledge to achieve practical management of AOD**. There are four work packages that cover the following aims:*

**WP1**: To investigate beetle-bacteria interactions to determine the role of the beetle in AOD. **It addresses the question: 'Is *Agrilus* essential to AOD?'**

**WP2**: To determine the effect of drought and nutrient stress on oak health, disease establishment, and the oak microbiome. **It addresses questions on 'The effects of drought or nutrient predisposition on tree health & AOD'**

**WP3**: To examine the values and attitudes of the public, forest and tree practitioners, scientists and policymakers towards oak & AOD Management. **It addresses questions about the 'acceptability of management practices'**

**WP4**: To study the bacteria causing AOD and analogous infections in other tree species. **It addresses the questions about 'pathogen host ranges and spread'**



# Oaks – a thousand year project – today's young trees - tomorrow's ancient and veterans



Thank you for joining in and enjoy your meeting