

Research Needs/gaps?

Pathogen

- a. The genetic diversity of DNB populations?
- b. Where the sexual stage of *D. septosporum* is present and the role that it plays?
- c. Determination of whether *D. pini* has a sexual stage and the role it plays?
- d. The potential for hybridisation between *D. septosporum* and *D. pini*? The potential impacts would be in terms of pathogenicity?
- e. Variation in virulence/pathogenicity of different populations of *D. septosporum* and *D. pini*?
- f. Systematic surveys of the extent, spread and severity of DNB on all conifer hosts?
- g. The potential for using alternative methods of surveillance. i.e. hyperspectral remote sensing, lidar and other satellite techniques?

Environment

- a. Spore dispersal – distances, timing and spore persistence under different conditions?
- b. Critical spore loads?
- c. Predicting spread and intensity/severity i.e. modelling?
- d. Climatic links to DNB severity, and potential impacts of climate change?
- e. The impacts of other environmental influences (aspect, topography, altitude, soil) on the occurrence and severity of DNB?
- f. Interactions of DNB with other pests and pathogens?
- g. The effectiveness of management interventions (including different initial planting densities, changes to thinning intensity and cycle length, respacing of young crops, pruning, brashing, the use of mixtures and continuous cover forestry) under different climatic/site conditions and on different host species?
- h. The efficacy of chemical controls?
- i. Potential use of biocontrols and/or increased host resilience?

Host

- a. Are trees of all species affected at all ages? Will some species reach resistance with age, or become more susceptible as they get older? What are the triggers behind this?
- b. The potential for tree selection/ tree breeding; could rapid methods to select resistant traits and subsequent breeding programmes be initiated?
- c. The impacts on yield and mortality by host/location etc?
- d. The impacts on timber quality (including strength properties, porosity, density, uptake of preservative treatments, moisture loss, form etc)