

Will ash dieback alter the future direction of an ancient woodland?

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Introduction
Ash dieback is an invasive fungal disease of the common ash tree, *Fraxinus excelsior*, caused by the fungal pathogen, *Hymenoscyphus fraxineus*. It's spread from its origins in Asia to continental Europe and was officially confirmed in the UK in 2012. The full impact of Ash dieback in Britain is unknown, however it has the potential to cause significant damage to the UK Ash population, believed to be fatal in most cases of infection. With most species of ash susceptible to dieback, the future of forest ecosystems and its biodiversity throughout the UK and Europe is threatened.

Project brief
This project is based in Treswell Wood in Nottinghamshire, an ancient woodland dominated by ash (*Fraxinus excelsior*) and oak (*Quercus sp.*) trees. Currently the ash is most abundant, however, the appearance of ash dieback within the last year threatens to change that.

In this study we aim to quantify the current state of ash dieback in Treswell Wood, and predict whether ash dieback will alter the future habitat composition of the landscape.

We will focus on an area of arable land undergoing re-colonisation, receiving a natural influx of ash and oak seeds along with other plant and animal species. Ash sapling height, density, and disease status will be recorded both in the assart (arable land) and the woodland itself. We aim to discover if the occurrence of ash dieback at this critical point in the colonisation of the new area will lead to an oak-dominated woodland rather than an ash-dominated one.

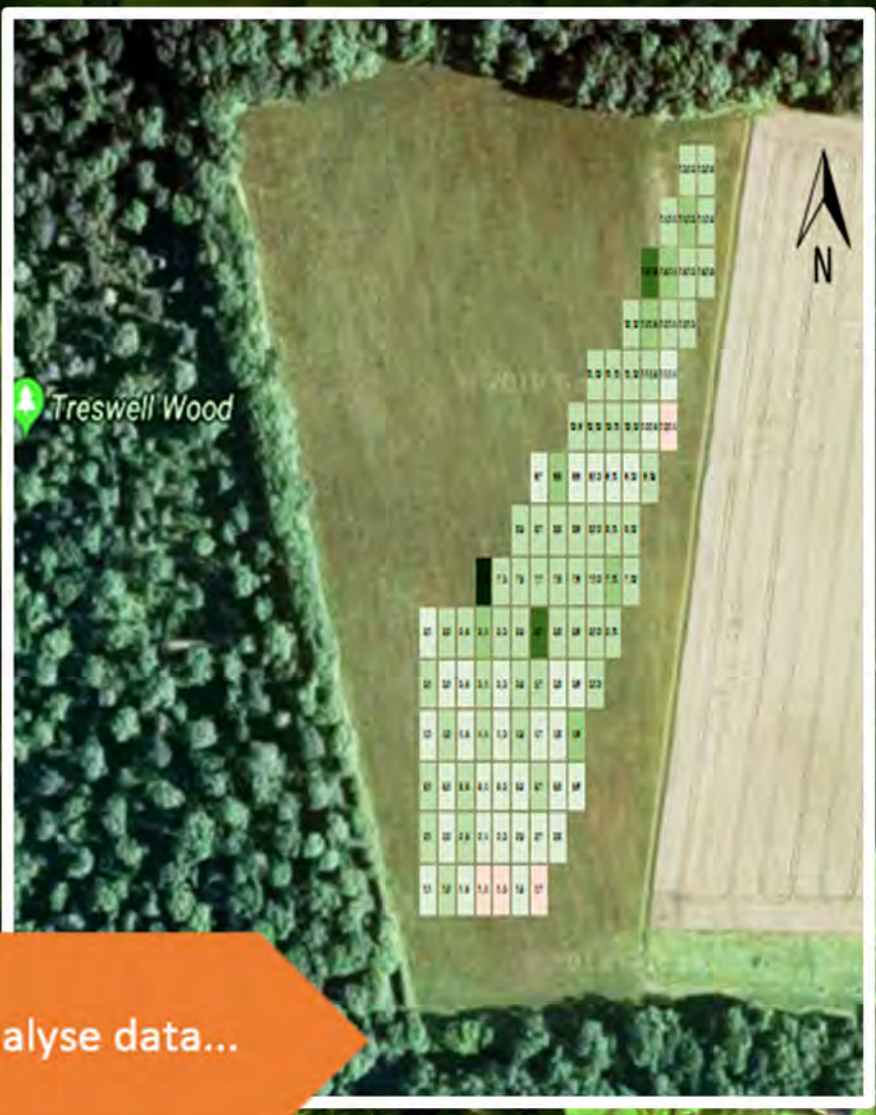


Figure 2. (Up) Treswell Wood Assart sampling grid. Quadrat size = 4x4m. Distance between quadrats 10x20m

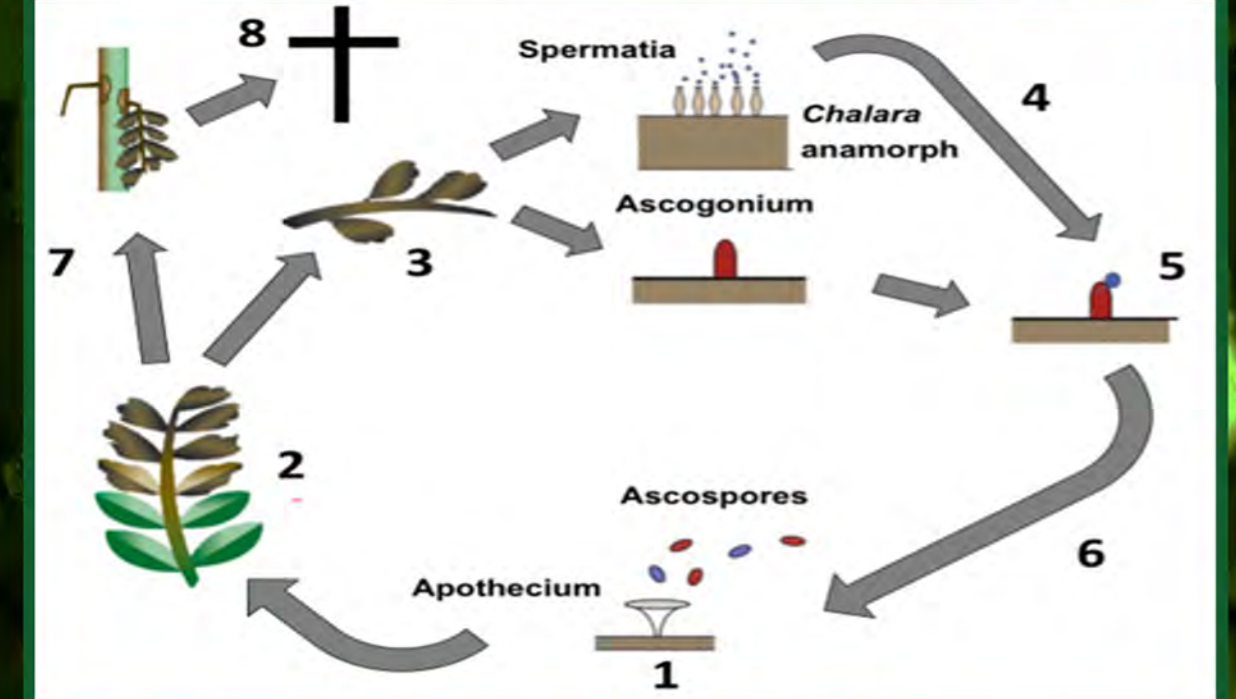


Figure 1. Life cycle of ash dieback, *Hymenoscyphus fraxineus*.

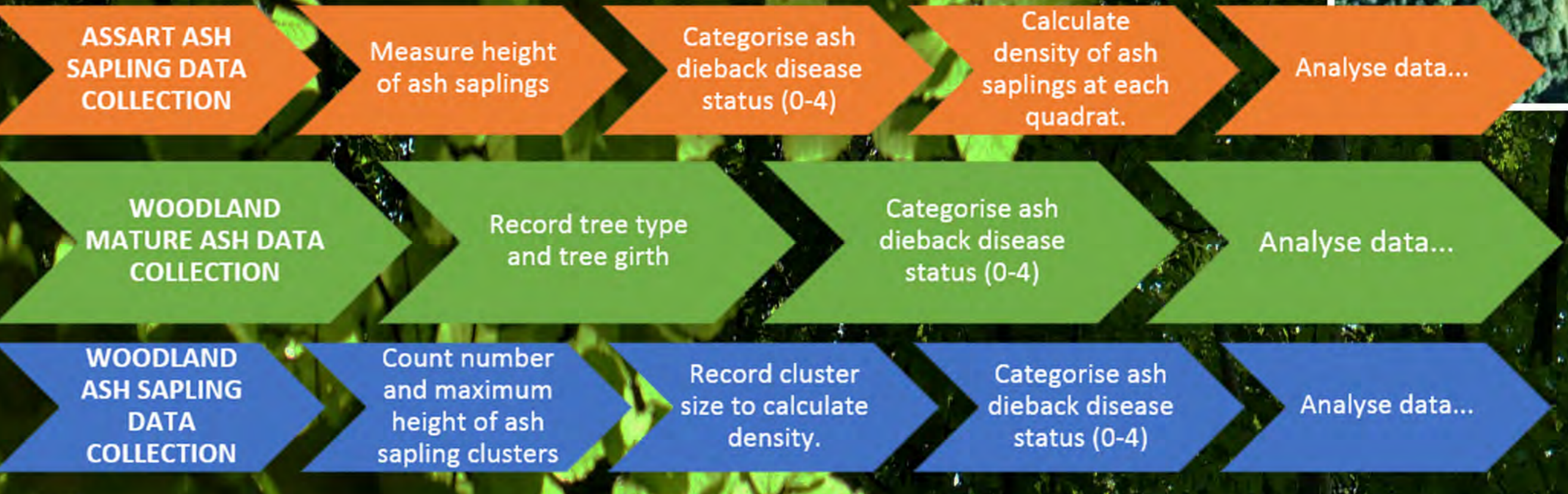


Figure 3. (Left) Methods flow chart.



Figure 4. Categorising ash sapling disease status (Score 0-4).

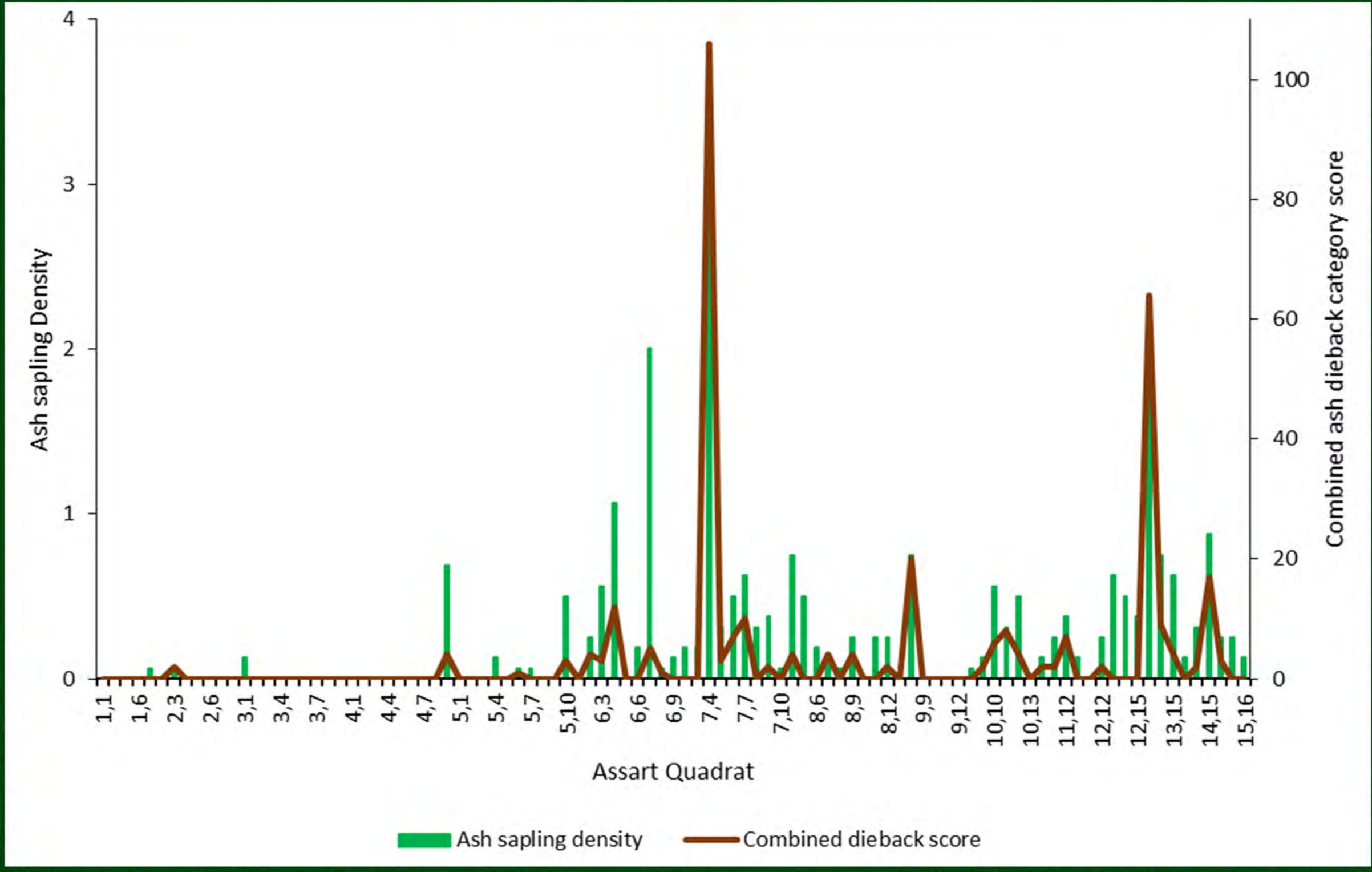


Figure 5: Relationship between ash sapling density at each quadrat and the combined ash dieback score of each ash sapling. ($P > 0.001$)

Findings
Ash dieback stage is significantly related to ash sapling density (figure 1) and ash height (figure 2), (both $P < 0.001$), i.e., higher density and taller saplings are associated with increased dieback (general linear model for all dieback stages or logistic regression with uninfected and infected individuals).
Preliminary results of mature ash trees show the type of forest management treatment (coppiced or uncoppiced) influences the susceptibility of the tree to being infected with ash dieback, due to its spreading nature from infected leaf litter on the ground, via air borne ascospores.

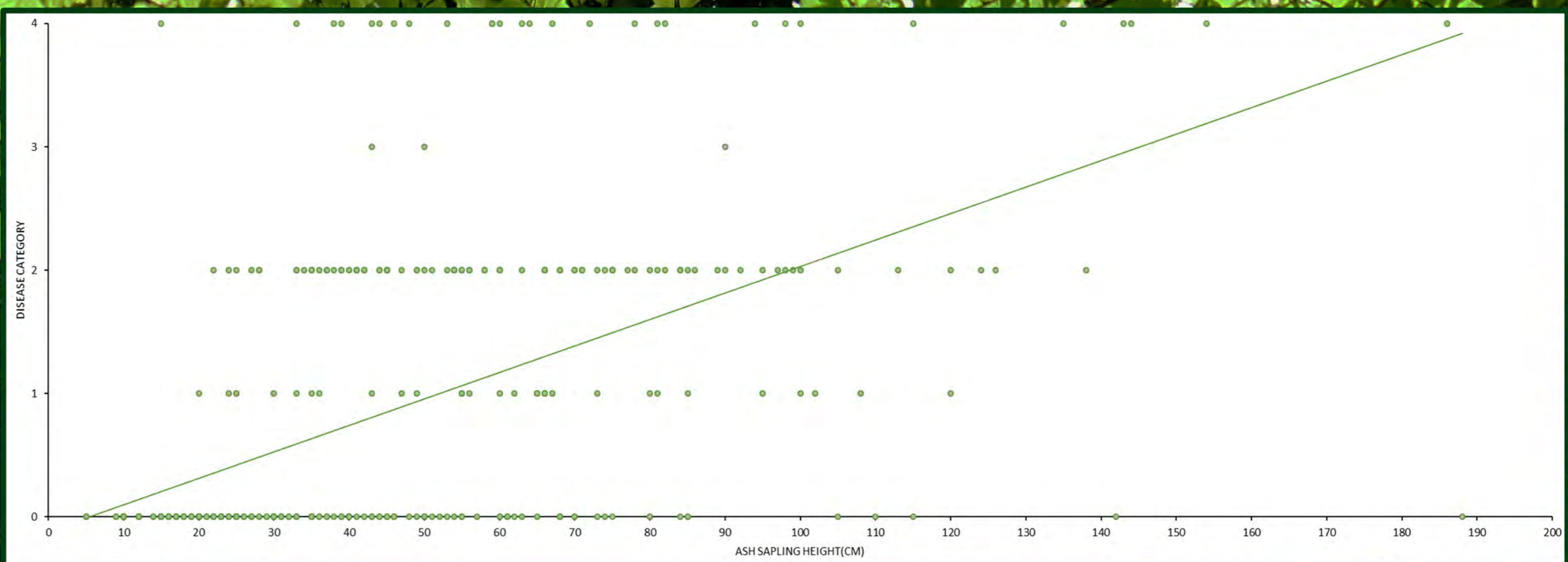


Figure 6: Relationship between ash sapling height (cm) and their ash dieback status category. ($P > 0.001$)

Conclusion
Our findings show that the natural clustering of ash seedlings can cause a higher incidence of ash dieback. These findings support the known life cycle of the fungus where developed fruiting bodies on infected leaf litter of the previous year release ascospores between June and September to infect new leaves of ash trees.
Due to the time of year dieback ascospores are released to infect new ash leaves, ash seedlings that germinate and establish in spring are at a lower risk of being infected, than larger saplings.
It's clear ash dieback is having a significant effect in the assart, where 69% of all saplings recorded over 30cm tall showed symptoms of ash dieback infection. This information in terms of rewilding and regeneration efforts, suggests the new woodland will not be ash dominated. Consequences of this could include the loss and disturbance of the 955 species known to be associated with ash.

Ongoing Research
Data processing and analyses are currently being performed on data collected from mature and immature ash trees recorded in the woodland. A direct comparison will be made between the ash saplings of the assart and wood. This analysis will help draw conclusions about the incidence of the disease in open, exposed spaces, such as in the assart, and closed spaces, in the woodland.
Dissemination of results in the first instance will be via the Notts Wildlife Trust and the Treswell Wood newsletter and then to generate a short paper for publication in a conservation ecology journal.

Acknowledgements
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