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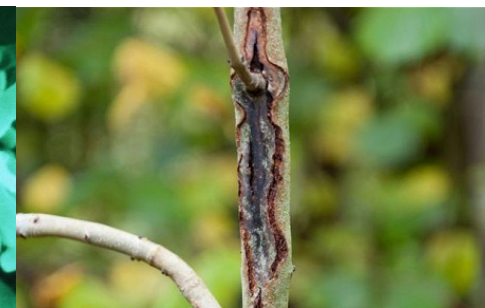
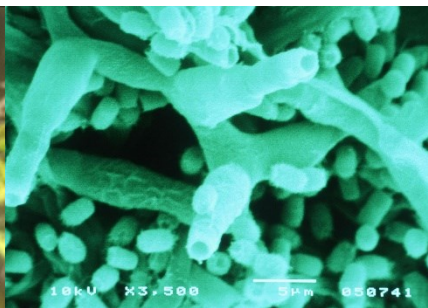
UNIVERSITY  
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WOODLAND  
TRUST

# MODELLING THE EFFECTS OF ASH DIEBACK ON WOODLAND CONNECTIVITY

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# Ash dieback background and impact

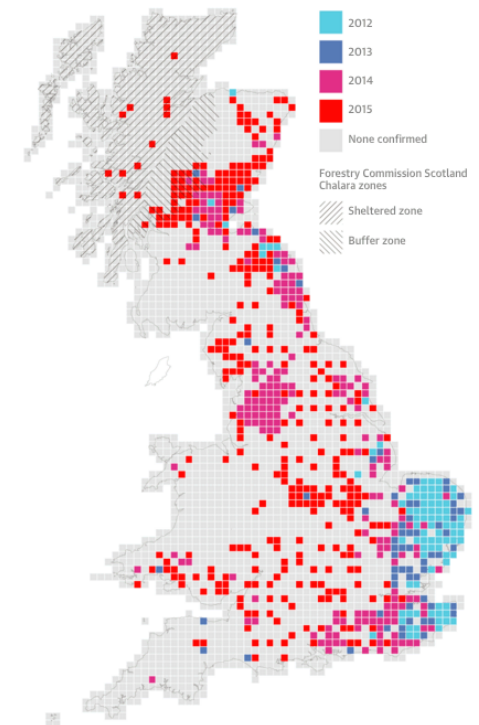
Fungal disease (*Hymenoscyphus fraxineus*) kills ash trees by blocking the water transport system leading to crown loss.

First identified in the UK in 2012 and continues to spread rapidly.

NGO's are predicting widespread catastrophic loss of ash.

## Spread of ash dieback

Ordnance Survey 10km grid squares containing one or more Chalara infections by year of identification



Guardian graphic

Source: Forestry Commission

# Why does ash loss matter for biodiversity?

Ash is the second most abundant tree species in small woodland patches in GB after Oak (CEH countryside survey).

Ash is the most common hedgerow (and roadside) tree species (CEH countryside survey).

Forty-four 'obligate' species associated with ash (Mitchell et al. 2016).

Hedgerows and roadside trees act as corridors.

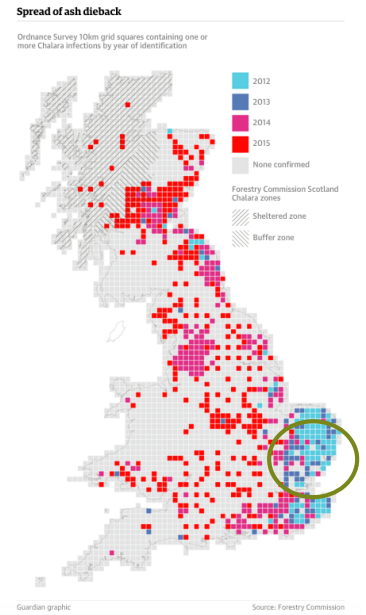
Dying roadside trees are dangerous - felling.



# Modelling approach

Individual based modelling approach simulating the movement and lifecycle of theoretical species' on a real landscape (RangeShifter platform).

Focal area was 10km<sup>2</sup> area in Suffolk – ground zero for dieback.



Canopy tree data was extracted from the National Tree Map data.

Trees classified:

Woodland trees (breeding habitat)

Roadside trees

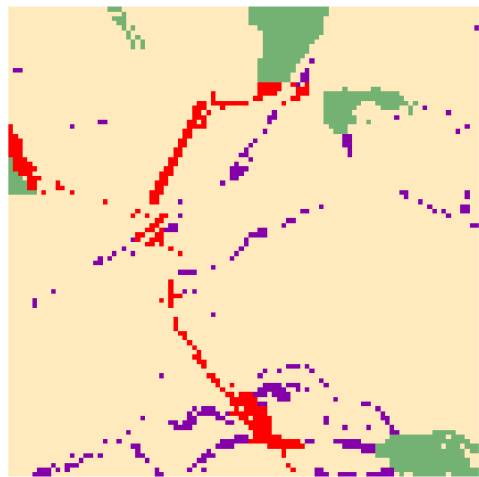
Matrix trees

# Movement of species



Assume species use roadside and matrix trees as corridors between breeding woodland habitat.

Assume a mortality cost with movement through open spaces – predation/dessication etc.



- Matrix
- Woodland
- Matrix trees
- Roadside trees

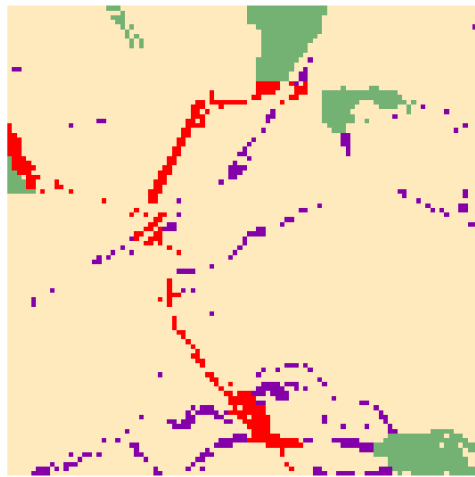
0 0.25 0.5 1 Kilometers

Thus the cost of movement was lower when individuals moved through trees rather than open space.

Individual not naive – have sensory parameters providing ability to navigate towards trees in the landscape.

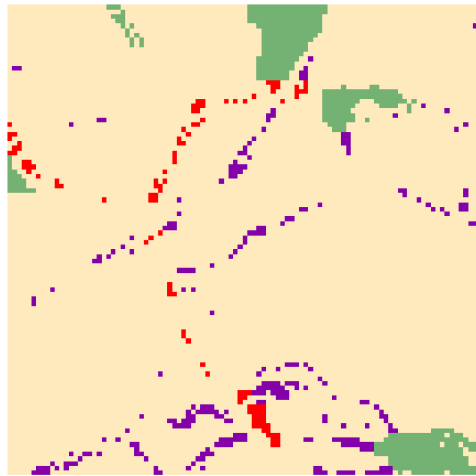
81 different 'species' – varying parameters controlling movement.

# Removal of roadside trees



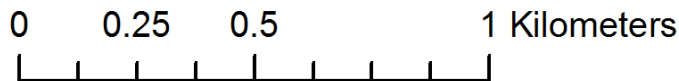
- Matrix
- Woodland
- Matrix trees
- Roadside trees

Susceptible roadside trees lost due to felling.



3 removal scenarios generated in arcGIS  
-20%, -40%, -60% roadside trees

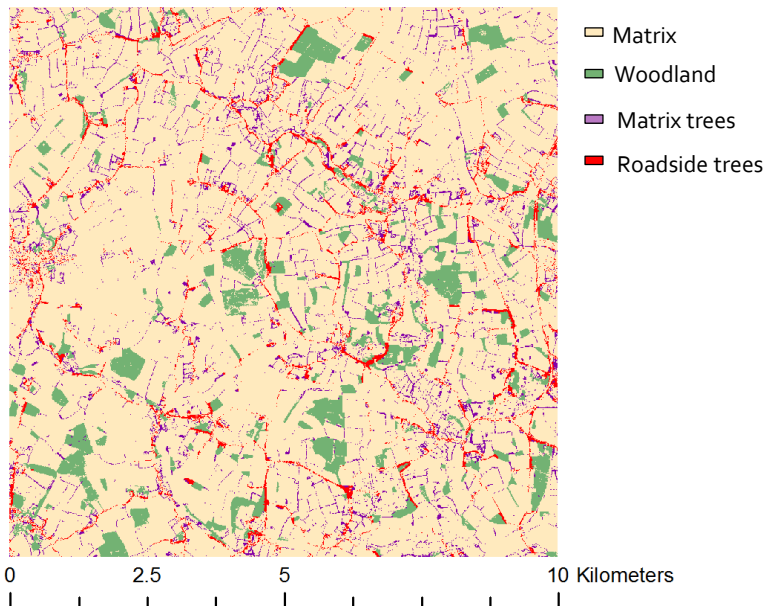
Will roadside trees loss affect connectivity  
between breeding patches? (green areas)



# Not a huge effect

Removal scenario	Successful emigrants as a proportion of baseline	
	Mean	S.E.
20%	0.905	0.00070
40%	0.884	0.00085
60%	0.863	0.00100

But...



Roadside trees only account for 3% of the cover.

While matrix trees account for 10%.

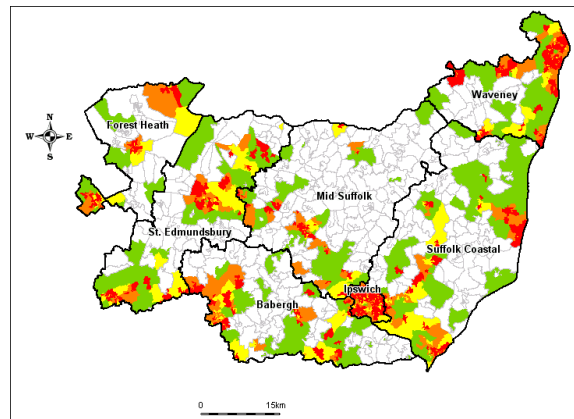
Perhaps the presence of matrix trees buffers roadside tree loss?

# Work in progress...

In the first area there was little effect of roadside tree loss.  
What about other areas with fewer matrix trees?



WT - scaling up to generate a map of impact for Suffolk





# Future work

Removal Scenario	Mean successful emigrants	S.E. successful emigrants	Variance (%) due to			
			Carrying capacity	Mortality from crossing matrix habitat	Perceptual range of individuals	Directional persistence of individuals
20%	0.905	0.00070	22.9	7.66	12.4	42.6
40%	0.884	0.00085	20.6	10.8	12.6	41.7
60%	0.863	0.00100	22.4	13.3	11.2	39.8

Rather than systematically test parameter space

-> Ruth Mitchell - Parameterise model for a real species.

## Mitigation scenarios

- replanting, WT 'disease recovery packs'
- replanting, with genetically resistant trees 'Betty'



# More information

