Wood Ants of Wyre

PAUL WILSON

Love or hate them, you often can't avoid them. There are times when the Wyre Forest feels full of them. Wood ants so big they were once called 'horse ants'; crawling in long lines, reminiscent of army ants. It is to these ants that we turn our attention in this article. Indeed, they took my attention for a number of weeks in 2010, as I measured and counted over 240 Red Wood Ant nests as a M.Sc. student.

The most commonly encountered wood ant in the Wyre Forest is *Formica rufa*, officially titled the Red Wood Ant. It's not the only wood ant in the Wyre Forest but it is the most numerous and conspicuous with its domed nests. The Slave-making Ant *Formica sanguinea*, formerly called the 'Blood Red Ant', is also present. This species is much more scarce, rating a 'notable B' national status. They are very similar in appearance, but the Slave-making Ant tends to nest under stones and does not create the domed nest structures so common and familiar in the forest. It has anti-social tendencies towards other species, such as *Formica fusca*, raiding their nests for pupae, some of which it rears to produce 'slave' workers for its own colony.

In the UK the Red Wood Ant is sometimes incorrectly called the 'Southern Wood Ant'. Despite the southerly bias of its range, it is recorded as far north as the Lake District. To the north and west of the Wyre Forest, the range of this ant overlaps with the Northern Wood Ant *Formica lugubris*. By contrast, the Slave-making Ant is much more a creature of the downs and heaths of the south, with only sporadic English records north of London – Bristol. That is, except for Scotland, where an extensive population is found alongside the appropriately named Scottish Wood Ant.

Formica rufa Paul Wilson

Wood ants being poor colonisers of new habitats tend to exist in ancient woodland. Worcestershire records for both Red Wood and Slave-making Ants come almost exclusively from the Wyre Forest area, though Red Wood Ants are also recorded in a few other woodlands in Worcestershire, and in south west Shropshire. In the Wyre Forest, Red Wood Ant nests are most obvious on the south facing slopes that rise from Dowles Brook to Hawkbatch. They can be found in many areas of the forest, but they seem absent or rare in others. For example, there seem to be few or no nests in Brant Wood or Town Coppice. The current distribution map is biased, though not entirely misleading, because most of the records now come from my study. That is why the Study Group is now trying to survey the rest of the Forest to get the full picture.

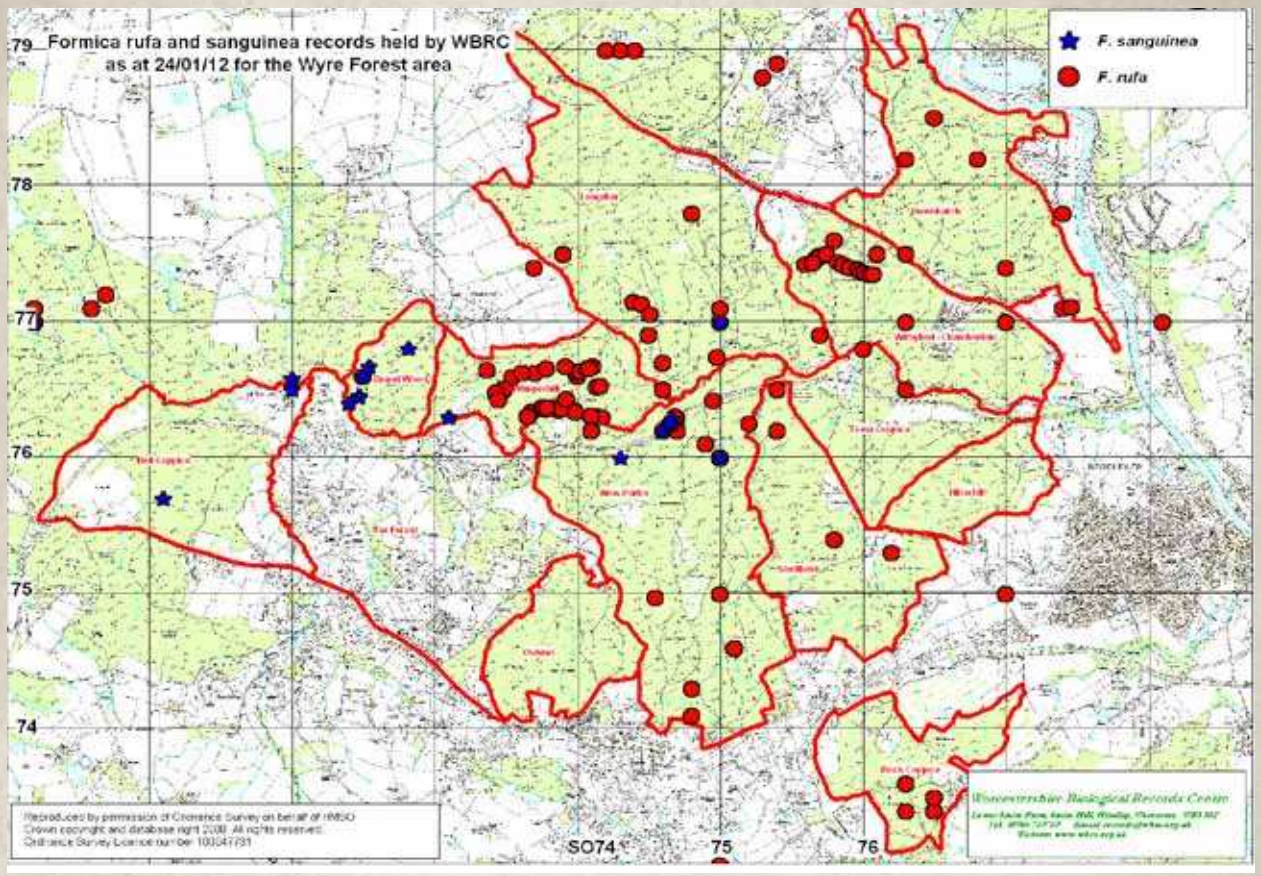
Interestingly, the Red Wood Ant does not seem to exist in exactly the same places as the Slave-maker Ant and they may avoid each other by detecting their mutual scent. Another factor is their habitat preferences, as the Slave-maker Ant seems to favour more the open heathland compared with the Red Wood Ant. Pontin (1996) found most Slave-maker nests were in open situations and intercepted 50 to 100% of possible sunlight, compared with the more shaded Red Wood Ant nests which only intercepted 25-75%. It's clearly an interesting subject for further work.

Studies in Wyre

Both Red Wood Ants and Slave-maker Ants were recorded by Fletcher & Martineau within the 1901 Victoria County History. They were described as very common in the Wyre Forest. A view that was echoed by Norman Hickin in 1971: who found it "difficult to sit down for a picnic within the forest" due to the Red Wood Ants. The Slave-making Ant he also called "very abundant". However, by the late 1980's concern was growing that the Slave-making Ant might be losing habitat, and by 2006 Mike Bloxham had so few records that he speculated that only one colony might remain. In response to this clarion call intense searching resulted in 21 records in 2009.

Research studies of British wood ants are few and far between, so it's not a surprise to find there have only been a few for the Wyre Forest. These studies have mainly been done by students. Andrew Girling's study carried out in 2000 has been summarised by him in an excellent paper in the WFSG Review. His work demonstrates how Red Wood Ant nest position and orientation optimise the interception sunlight (insolation), and how increased nest size is correlated with both distances between nests and increased levels of foraging. His work also provides a wealth of background information on Red Wood Ant biology.

In 2011, when I was doing my study, Rebecca Hilton was examining the effects of mountain bike disturbance on Red Wood Ants and ground beetles in Ribbesford Woods. Using pitfall traps, she found higher levels of carabid beetles in areas where wood ants were absent,



confirming earlier studies which indicated that the presence of wood ants had a significant effect on the species and abundance of other invertebrates. But despite finding lower numbers of wood ants in areas used by mountain bikers, she could not equivocally confirm that wood ant numbers had been significantly reduced as a result of this recreational use.

Red Wood Ants and Habitat Management

Woodlands were once managed to provide timber. The Forestry Commission 1960 Working Plan stated that naturalists should "accept with good grace" any subsequent changes to the flora and fauna of the forest (Hickmann 1995). Things are very different now, with nature conservation established as a legitimate forestry goal. In the last two decades woodland glades and rides have increasingly been viewed as important wildlife habitats, not merely routes for extracting timber. The result has been much ride widening and edge scalloping (see Ferris & Carter 2000), often inspired by bird, butterfly, and mammal conservationists with a good knowledge of the needs of their target species.

While most seemed to think that ride widening would generally benefit invertebrates, there was a lack of specific knowledge, and occasional notes of caution. For example, Harry Green warned in the 2009 WFSG Review that *Formica rufa* [the Red Wood Ant] though regarded as commonplace and abundant in Wyre was likely to have declined and would continue to unless consideration was given to it during forestry activities. Nests could be severly damaged by forestry work and be subjected to loss of protection from the weather. Worse, vigorous regrowth could lead to dense shady secondary woodland under which nests would not survive. No wonder Pontin in 1996 felt that the woodland ant species simply needed to be "left alone".

These concerns formed the background of my 2011 study of Red Wood Ant nest abundance and size in four rides in the Wyre Forest. My main hypothesis was that the density and footprint (combined diameters) of Red Wood Ant nests in rides, adjacent to south facing coniferous plantations, would be negatively related to the age of the ride after clearance/widening. I assumed that as time elapsed after clearance, rides would become shadier and therefore have fewer nests. To prove this I had to find rides that had been cleared at different times in the past.

I knew that, because wood ants use sunshine to heat their nests, a massive difference in wood ant numbers could be merely the result of ride orientation. So I had to ensure all the study rides ran in the same direction (east-west). The downside of this was that I

had to stick to coniferous forest edges as I could not find long enough deciduous rides with the correct orientation. However, with the help of all concerned, I was able to find four rides of around 500m from which to take my sample. The rides had been widened the previous winter, the winter before, five years ago, and more than five years ago respectively. By the end of my survey, I had searched for, counted, measured, and recorded the position of 132 Red Wood Ant nests, in 79 quadrats of a hundred square meters, plus recording the vegetation in each quadrat, and in some cases measuring the temperature gradient.

Ride Vegetation

So what did I learn? Woodland rides, especially in coniferous/oak forest do not scrub up quickly. Despite the ages of the rides, birch regeneration was sporadic and oak regeneration was thick but only in limited areas. Older rides did not have significantly shadier vegetation. However, where there was low scrub and tree regeneration, there was a significantly negative relationship with the density and combined footprint of Red Wood Ant nests; the effect was particularly marked where oak regeneration was concerned.

In all of the rides studied, the main shading vegetation was bracken. Brian (1977) implicated bracken in the destruction of wood ant colonies, and it is listed as a threat in some Local Biodiversity Action Plans. So,

Partial shading of Red Wood Ant nest by oak regeneration Paul Wilson

Partial shading of Red Wood Ant nest by bracken Paul Wilson

Partial shading of Red Wood Ant nest by bramble Paul Wilson

I expected to find that the degree of bracken cover would be directly, and negatively, related to the density and footprint of wood ant nests. But this proved not to be so. Did this mean that Red Wood Ants built nests under bracken? The wood ant is not without an ability to live in shade. It generates metabolic heat in its nest by utilising the high energy sugary honeydew it collects from aphids, and can raise the nest temperature as much as 10˚C. So, while Red Wood Ants need to maximise insolation in spring, they are regarded as "shade tolerant" later in the year (Pontin 1996).

However, all of my searching only revealed 2% of nests to be over 60% shaded, and major shading was always caused by bracken. If wood ants were not nesting under bracken, why was this not reflected in the figures for density of nests? My conclusion was that other factors, such as territoriality, competition and resource availability, caused a spread of nests, and in the majority of 100m^2 quadrats surveyed there was always some clear ground. This open ground was often close to the woodland edge, and if there was clear ground, these creatures would successfully nest in it. That wood ants would 'avoid' bracken shade is not surprising for a creature whose optimum nest position is one that best intercepts the suns rays, but this is unlikely to be a matter of choice. Evacuation to a new site is thought to be a rare occurance, it is more likely that unshaded nests are the only nests that survive. Although other studies have found more surviving bracken shaded nests they are among the older (20 years old) and bigger colonies (Robinson 2008).

There were a few other related characteristics of woodland rides that affected the number of Red Wood Ant nests. Southerly aspect still played a role in determining the nest density and footprint even though the rides ran generally east-west. For example, 10% of the variation in nest footprint could still be explained by the number of degrees to which ride aspect varied from south.

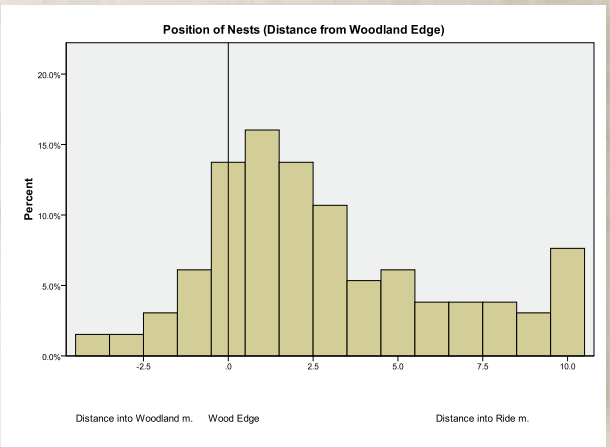
Ride Widening

Ride width is particularly significant because the surrounding trees can block off sunlight. My results indicated that where rides were below 20m in width, the narrower the ride the fewer the nests. But, where the width was over 20m there was no gain with additional width.

Ride widening, like most forestry activities, takes place in winter. In Red Wood Ant terms forestry activities can be considered as either total demolition, theft of roof insulation and solar panels, or waking to find your house has been moved down the road some distance from the shops. The nest could be totally destroyed by ride widening works but this is thought to be unlikely if simple tree felling is employed (Robinson & Robinson 2008). Slightly less serious could be the removal of the nest thatch. While this may not kill the queen and attendants which burrow below ground level for the winter, the thatch is not going to be there to perform its function of intercepting early spring sunshine, or providing insulation at a time when the ants may not be able to produce metabolic heat by processing sundew. May is thought to be a particularly critical time when the colony is rearing a new season's brood and a cold spring may hamper reconstruction efforts.

Optimum woodland edge habitat - brash, no bracken P. Wilson

The vast majority of Red Wood Ant Nests are found on the northern woodland edge; here they have the double benefit of shelter from the trees and sunlight from across the ride. This effect creates a clear temperature gradient that peaks at the woodland edge and declines as one moves out into the ride. Not surprisingly, Red Wood Ant nest density also peaks at the northern woodland edge and decreases out into the ride, and they rarely choose the other side. My research suggested a real relationship between nest density and summer daytime temperature of the soil surface. The centre of the ride may get plenty of sunshine, but it is also most exposed to wind and frost and is inevitably cooler than the south facing northern woodland edge. So as an ant colony living happily on the sunny woodland edge the last thing you expect is to wake up after winter and find the ride has been widened and your woodland edge is now several metres away.



Distribution of Red Wood Ant nests within Wyre Forest rides indicating a clear preference for woodland edge locations.

In addition to the loss of a warmer nest position after ride widening, colonies have to face two further threats arising from the work. One is the nest is now further from the trees which provide the colony with food, more energy must be put into reaching the woodland and realigning territories. Potentially more disastrous is the effect of rain. Robinson (2001) recorded the extinction of Red Wood Ant nests in some sites in the Lake District as the result of two years of heavy spring rain. However, it is probably only the nests in the most exposed position that are at risk, and I can see a few nests on the open steep slopes above Dowles Brook succumbing as a result of ride widening activities there.

Exposed nests above Dowles Brook Paul Wilson

However, In the Wyre Forest, there was no evidence of population decimation on any ride widened recently. Populations seemed healthy, even on the ride where very heavy machinery had been used and many established nests must have been destroyed or heavily damaged. Furthermore, the presence of new brash and woody debris in the rides, ranging from branches to chippings, was positively associated with nest density,

though not combined nest footprint, indicating that it was probably being used as the basis for new nests. Many new nests were also observed around stumps where they had been left after ride clearance.

Age and Tree Species

There was a very clear relationship between nest density and combined footprint with the age of the ride. Younger rides had more nests, which were generally smaller. Older rides had fewer nests which were generally larger, supporting earlier findings that nest size was positively correlated with the distance between colonies (Girling 2001, Robinson 2001). It seems logical that, where clearance /widening ride occurs, it disrupts any former nest pattern and creates both new optimal habitat at the new woodland edge, and new nest foundations in the shape of brash and stumps. In rides which had been cleared/widened five or more years earlier, there was no clear indication of significantly more bracken with age, but there was more tree regeneration. However, I could not statistically relate this to the trend to a smaller number of larger nests.

My results suggested that the trend from many small nests to a few big nests was not simply a response to increased nest shading caused by plant succession in the years after clearance/ widening, but was also about the need to colonise new optimal habitat at the woodland edge. However, Girling (2001) had noted, in his earlier Wyre study, that larger nest colonies seem to tolerate more active shading, and I expect this is generally true, and in other types of ride succession may be seen to be more influential.

Wood ants are thought to select trees within their territory based on seasonal prey or aphid abundance. However, they can only exercise this 'choice' within the type of woodland, often a timber monoculture (but never beech), in which they seem to live happily, by utilising the dominant commercial tree and associated secondary trees and vegetation for foraging. This probably explains why Girling (2001) found that tree species did not seem to affect nest distribution compared with other factors. However, my results may well indicate that the fairly open Scots Pine plantation may contain more foraging resources than the Douglas Fir equivalent, resulting in a marginally (but significantly) greater nest density in its proximity.

This question of disturbance and consolidation was examined by Robinson (2001), who introduced the idea of dynamic and static colonies, the latter in sub-optimal habitat, were characterized by a small number of large nests which merely persisted and were at risk of extinction. Dynamic colonies, however, had both old and new nests as colonies renewed themselves, maintaining at least a static population. It is therefore likely that in the older rides in the Wyre Forest the Red Wood Ant has responded to the static and less optimal conditions, and not only have the numbers of ants nests declined, but they have lost their tendency to reproduce and spread.

Implications for Conservation

Dr. Norman Hickin famously noted that "In 1965 I counted 35 of such nests [of *Formica rufa*] along about three-quarters of a mile of the path alongside Dowles Brook; each of these nests was actually on the path edge and with a south facing aspect" (Hickin 1971). This works out as 46.7 nests per mile. In 2010, in the rides used for this study in 2010, there were on average 1.7 nests every 10m, which works out at 46.51 nests per mile (or 83.5 per ha). While we are not talking about the same rides or habitat (Hickin was probably talking about oak woodland), it would be tempting to conclude that not much has changed and that in the Wyre Forest the Red Wood Ant is as common and widespread as ever.

However, we lack any real baseline for understanding the Red Wood Ant population in the Forest, and are unable to determine whether it is in decline or at what rate. Pontin (2005) sounds a further note of caution: Red Wood ant records seem to come from old habitats; that they are poor colonisers of isolated new woodlands, and extinctions of closely related species have occurred. We must remember that the latter is only locally common in the Wyre Forest and has declined in the rest of Worcestershire, and the Slave-maker Ant is rarer and even more vulnerable.

Ride managements can include bracken management for butterflies. Bracken is certainly a negative in that in the Wyre Forest few Red Wood Ant nests seem to persist under bracken. But, we have also seen that nests prosper in the gaps within bracken and that it is not related to low density of nests in the rides studied. Bracken does not seem to grow well at the woodland edge creating a gap which Red Wood Ants utilise for their nests. Bracken also provides positive features such as prey insects and nectaries; it provides shelter for nests from the wind, and even some shade at the height of summer. Bracken management is therefore not the answer to Red Wood Ant conservation, though some removal may help, but neither is it likely to be a major threat if obvious nest destruction is avoided, as few nests persist under it.

In optimum habitats the Red Wood Ant should not suffer because of ride widening activities in the Wyre

Forest; indeed providing established nests survive, widening should encourage dynamism and new nest building. However, it may also expose nests to damaging environmental conditions (particularly rain), or wipe out isolated nests existing in sub-optimal shady or exposed habitat.

The key to this type of habitat management is akin to coppicing, a practice that is felt to help maintain dynamic populations of Red Wood Ants (Robinson & Robinson 2008). Coppicing traditionally is cyclic with different coupes cut each year. However, the economic temptation is to widen rides in one go all along their length. I think this temptation is increased if the northern edge is purely conifers, which may be perceived as of low wildlife value (and will not coppice as broadleaves do). This may mean that a swathe is cut through the primary Red Wood Ant habitat. Scalloping is a preferable method as it only alters some of the ride edge, and creates less of a wind corridor. Another approach is to widen the rides in sections over many years. Then, not only are the rides edges more visually and ecologically interesting, sufficient established nests should survive to furnish new queens and males ensuring the maintenance of a stable Red Wood Ant population.

Acknowledgements

I would like to thank Grow With Wyre for sponsoring this project and Natural England and the Forestry Commission for their advice and assistance.

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Formica rufa, Wyre Forest, 11 July 2009 Rosemary Winnall