TRANSACTIONS

of the

NORFOLK & NORWICH NATURALISTS' SOCIETY

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Norfolk's Unofficial Naturalists

Presidential Address 22nd November 2005

Richard Mabey

I've called this talk 'Norfolk's Unofficial Naturalists' for uncomplicated reasons: it's about some of the writers, artists and anonymous observers who have helped to build up a picture of the nature of Norfolk without themselves being naturalists, or even having and interest in the *formal* study of our fellow organisms. But I was also thinking of Rupert Brook's poem, about the old vicarage at Grantchester:

> Unkempt about those hedges blows
> An unofficial English rose.
> And there the unregulated sun
> Slopes down to rest when the day is done.

I like the feeling in these lines that nature too can be unofficial, in the margins, as unregulated as the sun, and that its celebration can echo that playfulness.

Perhaps I can give an example from Norfolk of how I think the informal observation of nature enters and shapes the naturalist's view of our county. You will have heard the old nickname 'Poppyland' for the landscape just inland from Cromer – a description which these days may sound rather tongue-in-cheek! This is how the name originated. In the 1880s the Daily Telegraph's drama critic, Clement Scott, had become a regular visitor to Cromer and Overstrand, and he'd fallen in love not just with the local miller's daughter, but with the sight of waves of scarlet blossoms in the fields and churchyards, sweeping down to the very edge of the cliffs, and set against the sparkle of the North Sea. He began to write ecstatic columns about what he christened Poppyland in the August of 1883, and started a craze that brought thousands of visitors to the little villages along what, scarcely believing its good luck, the Great Eastern Railway rapidly renamed The Poppy Line. Scott also wrote a popular but painfully sentimental verse about his Norfolk Arcadia, entitled The Garden of Sleep:

> Neath the blue of the sky, in the green of the corn
> It is there that the regal red poppies are born!
> Brief days of desire, and long dreams of delight,
> They are mind when my Poppy-land cometh in sight.

Scott could hardly be called an official naturalist, and certainly wasn't much of a botanist, muddling up, as many others have done, the field poppy with the sleep-inducing opium poppy. But I suspect that it was his doggerel verses – just as much as the paintings of the Impressionists or John Ruskin's elegant essays –

that began to imbue arable weeds with the romance they still have, as symbols of an older countryside. Remember that he was writing 30 years before the Battle of the Somme, whose miraculous sproutings amongst the carnage were to give the poppy yet another symbolic meaning.

I think this is one of the ways that the work of imaginative writers and artists underpin natural history. They change our attention, make us look – not just at new things, but in new and different ways. Certainly as someone who has never had any pretensions to be an official naturalist myself, I see my own role as a writer as exploring our *relationships* with nature more than "nature itself". Of course even poets can be precise observers. John Clare, over to our west in Northamptonshire, is credited with 65 first county records for birds and 40 plants. Crabbe left an exact account of the 18th century flora of the Aldeburgh coast that is still recognisable today. We haven't had poets of that kind in Norfolk, any more than we've had artists with the breadth of Suffolk's John Nash, whose paintings of plants hang in national galleries, and who illustrated one of the finest editions of White's *Natural History of Selborne.*

But we've had great *landscape* painters, and in the details of their pictures there are fascinating details about the disposition of ancient habitats. Take for example the canvases of Mousehold Heath by the Norwich School painters. Both Crome and Cotman painted this once great waste east of Norwich, Cotman in 1810, Crome between 1818 and 1820. Both show the common as an immense sandy waste, quite treeless, and grazed by sheep. Both show an intricate skein of trackways wind towards the horizon. Yet the reality, by the time these paintings were made, was quite different. The heath had been enclosed in 1799, fenced, gated and divided up by straight new roads. The sheep and shepherds had been ejected. Crome especially, being a local man, was probably motivated as much by political anger as aesthetic feeling, and had painted his memory of the soft-edged, ecologically and socially diverse common. It's the best record we have of Mousehold's habitats before Enclosure – but also a warning about taking imaginative art too literally as a source of evidence.

But if it lacks exactness, Norfolk's unofficial natural history is rich in variety and impressionistic detail. A vast range of artists have featured it in their backgrounds and footnotes: George Borrow, in his Romany novels, WG Sebald's haunting tramps along the coast in *The Ring of Saturn*. Emerson's photographs of the Broads, William Riviere's epic fictions, LP Hartley's evocative novel of Edwardian rural Norfolk, *The Go-Between*, Mary Newcombe's vivid sketches of birds and landscapes … It would be a lifetime's work to pick out all the natural detailing in the more than half a millennium in which Norfolk has been imaginatively celebrated. I'll concentrate on three regions that I know a little of,

to give an idea of what can be found – the Waveney Valley, the north coast, and the edge of the Fens.

In the Waveney Valley, where I live myself, Roger Deakin is one of the great contemporary documentary writers. He is a Suffolk man strictly, living on the edge of Mellis Common, where he has the daily discipline, after breakfast, of keeping the Suffolk Wildlife Trust in check. In the mid-90's he explored Britain by swimming, which he believes to be the most intimate way you can get in touch with what is arguably East Anglia's fundamental element, and wrote his wonderful book *Waterlog* about the experience. One of his swims was up the Waveney:

> *Suffolk, 4 August.* Next day I met an otter in the Waveney. I swam round a bend in my favourite river in Suffolk and there it was, sunning itself on a floating log near a reed-bed. I would have valued a moment face to face, but it was too quick for that. It slipped into the water on the instant, the big paddle tail following through with such stealth that it left hardly a ripple. But I saw its white bib and the unmistakable bulk of the animal, and I knew I had intruded into its territory; knew also that it was underwater somewhere close, sensing my movements. It hadn't paused to puzzle over my unconventional mode of approach. It just went. It didn't miss a beat. We can scarcely be said to have communed, yet I can replay every frame of the brief encounter in slow motion, right down to the just-vacated wet log rolling back into balance, oscillating slightly, and my own emotions, a mixture of elation at a rare moment's audience with the most reclusive animal on the river (Ted Hughes called it 'a king in hiding') and shame at having interrupted its private reverie.
>
> I swam on beyond the otter pool, under some sort of spell. It struck me that the animal's particular magic does not stem so much from its rarity as its invisibility. It is through their puckish, Dionysian habit of veiling themselves from view that otters come to embody the river spirits themselves. Henry Williamson knew this when he wrote his great mythic poem of Tarka the Otter. In the best traditions of spirits, the otter reveals itself through signs. You hunt for their tracks on sandbars, or from their spraint, the aromatic dung they leave behind to mark their territory, like clues in an Easter-egg hunt, under bridges or on the lowest boughs of willow or alder.

Nearly a hundred years earlier, Virginia Woolf had spent a long summer's holiday at Blo Norton Hall, when she was 24 years old, and she occupied her time cycling about the lanes and exploring the local fens in the Waveney Valley. And, in a rather eerie premonition of how she was to die, repeatedly falling into the Little Ouse. Here are some of her diary entries.

> If this were the time or the place to uphold a paradox, I am half inclined to state that Norfolk is one of the most beautiful of counties. Indeed, let the artifice stand; for so there will be no need to expound it. And truly, it would need a careful and skilful brush to give a picture of this strange, grey green, undulating, dreaming, philosophising and remembering land; where one may walk 10 miles & meet no one; where soft grass paths strike gently over the land; where the roads are many & lonely,

> & the churches are innumerable & deserted. There is no use in a closer gaze at present.
>
> A second day reveals the fact, as facts go, that the country has possibilities. This morning for instance, we wandered into a lush fen, humming with dragonflies, & scented with meadow sweet. A pale windmill guarded it, stationary today I observe; for though the wind is God's wind, & will blow in spite of the Sabbath, one must not require it to work for human profit on a Sunday. Or how do the orthodox interpret these symbols?

Virginia Woolf's works, incidentally, have many sharp and original perspectives on human's attitudes towards nature. Her essay on *Gilbert White's Natural History of Selborne* is, in my opinion – and I think I probably read everything that was written about it when I was preparing White's biography – one of the most lucid and perceptive, and analyses the book as if it were a novel, beginning with the village in its woods and hills, then introducing a vast cast of continually re-emerging characters of all species, and concluding with a grand finale in which the village of Selborne is placed in the great climatic dramas of the world is revealed.

That knack of making the local universal is what marks great nature writing out from the merely mechanical, and, in what I've read of them so far, Norfolk novelists don't often reach these heights, certainly not on the north coast, where the county's writing output has been focused. There are countless evocations of the marshland in fiction – in novels by EF Benson, Angela Huth, Henry Sutton, even Jack Higgins whose famous war-time thriller *The Eagle has Landed* is set in the Glaven Valley and has a recognisable – and geomorphologically quite fair – description of Blakeney Point and Cley marshes. Yet in my reading there is something predictable and repetitive about their marshes, their essentially melancholy and lonely configurations of sea lavender and cord-grass, that miss their mercurial, shape-shifting liveliness and variety – which, of course, is to a large extent due to and narrated by their natural history.

But the poets and non-fiction writers are different. Here's a verse from a poem by Michael Laskey, an Essex man and the founder of the Aldeburgh poetry festival, but a frequent visitor to the north Norfolk coast. It's about the tern enclosures on Blakeney Point and catches marvellously the changed perceptions we can have of wildlife when we deliberately "frame" it.

> And as we looked
> around more birds
> materialised,
> more terns with slim
> decisive wings:
> the quick of clouds
> secured by string.

And here is TH White – a passage on where one of his characters from the *Once and Future King,* flies with the white-fronted geese. It's set along the Wash end of the coast.

> The eight geese spread out in line astern, evenly spaced, with him behind. They made for the east, where the poor light had been, and now, before them, the bold sun began to rise. A crack of orange broke the black cloud-bank far beyond the land; the glory spread, the salt marsh growing visible below. He saw it like a featureless moor or bogland, which had become maritime by accident; its heather, still looking like heather, having mated with the seaweed until it was a salt wet heather, with slippery fronds. The burns which should have run through the moorland were of sea-water on blueish mud. There were long nets here and there, erected on poles, into which unwary geese might fly. These, he now guessed, had been the occasions of those warning-notes. Two or three widgeon hung in one of them, and, far away to the eastward, a fly-like man was plodding over the slob in tiny persistence, to collect his bag.
>
> The sun, as it rose, tinged the quicksilver of the creeks and the gleaming slime itself with flame. The curlew, who had been piping their mournful plaints since long before the light, flew now from weed-bank to weed-bank: the widgeon, who had slept on water, came whistling their double notes, like whistles from a Christmas cracker: the mallard toiled from land, against the wind: the redshanks scuttled and prodded like mice: a cloud of tiny dunlin, more compact than starlings, turned in the air with the noise of a train: the black-guard of crows rose from the pine trees on the dunes, shore birds of every sort populated the tide line, filling it with business and beauty.

A favourite Norfolk writer of mine is the novelist Sylvia Townsend Warner. She was the daughter of George Warner, headteacher of Harrow – who incidentally had taught LP Hartley. But she spent her later years in Norfolk, in a succession of eccentric houses in Oby, Slolely, Winterton and Salthouse. She was also an upfront lesbian (her partner was the writer Valentine Acland) and a member of the communist party, so you can imagine the lively time the pair had in Norfolk in the 1940s and 50s! Her Salthouse home was a coastal cottage called Great Eye Folly (it was a folly indeed and was swept away in the '53 flood), and her diaries are full of evocative and unexpected notes about the natural history of her surroundings.

> *Nov. 20th* In the morning V's back was very bad – she had felt it give yesterday. And so I walked alone, by the sea's edge till I felt, like an animal – this is beyond any breathed air; and so it was, for climbing onto the shingle bank I found myself among the marrom tufts, and seeing a superb piece of marsh: the pale sharp poppy-horns standing above green frizzed cushions, marsh michaelmas daisy in thick grey thistledown mackerel-sky clouds, and the marsh water like blue lead above cushions of green moss and edged with rust-dark vegetation. I got a quantity of wood too, looking east to Salthouse church under a dark purple cloud.

More ordinary country dwellers have of course left their own indelible records in natural history, not least in the names of plants and birds – and places. Margaret

Gelling's work has shown just how much of the vocabulary of places derives from its natural features. Going back to the Waveney Valley, there's a string of place names that testify to it being what Virginia Woolf called it – a grey-green undulating wetland. Too many people imagine Diss was so called after Milton's word for hell, but in fact it's named after the mere, and the Anglo-Saxon word for a pool of standing water, *disce.* Redgrave is red-grove, after the alders probably. Hinderclay is the tongue of land in a river fork where elders grew. Thelnetham is the ham frequented by swans. Further north, Lyndford in Thetford Forest is an indication that small-leaved lime-trees grew there rather earlier than spruce. And the scatter of Ling place names across the county mark sites of heather, and therefore possibly of vanished heathland.

Some of the clues in name are more contentious. Our society's great ornithologist Mark Cocker, is convinced that the few instances of Poppylot, occurring as the name of farms in the Norfolk Fens, is an indication of areas where spoonbills once bred. It's quite a plausible argument. Popple is reputed an old Norfolk name for the species – but also a dialect word for poplar trees, and as a verb, most significantly, means to move to and fro in water – which is presumably the base from which both swaying trees and swaying bills were named. I was sceptical of Mark's claim, and pounced on him when I discovered a Poppylot farm in Bunwell, in a bit of central Norfolk where it is scarcely conceivable that spoonbills ever bred. But he promptly trumped me by pointing out that there was a hamlet called Spooners Row next door!

There are no 'earn' place name prefixes in Norfolk, so far as I know, so no places where eagles – and I'm talking about white-tailed eagles of course – were conspicuous enough to be worth commemorating. But Sir Thomas Browne, in his writings about the county, called them 'fen eagles', and having been widespread throughout England a thousand years ago, they were almost certainly breeding in the fens up to the 16th century, just as they are beginning to do again in the marshes of northern Holland. (They're the target keystone species of the great fen restoration project now proliferating in East Anglia.)

But there are eagles in the Fens – figured in the astonishing medieval woodcarvings that decorate the churches along the old eastern shoreline of the fens, at Mildenhall, Lakenheath, Feltwell and Methwold, especially. (Forgive me venturing into Suffolk a little, but fens are no respecter of county boundaries.) Perhaps they were inspired by live birds. Looking at the immense outstretched wings of the angels at Mildenhall – ginger at the base with grey-white primaries – it's easy to imagine they were modelled on marsh harriers.

But perhaps they are purely works of imagination, relying on traditional patterns and stereotypes. One of the most fascinating things about these fenland carvings

is that they were made in the early 1400s, when naturalistic representations of nature were beginning to take root amongst the formal figurings of the early medieval period. So, on the bench ends at Lakenheath, there are mythical animals that come straight out of the pattern-books of the Bestiaries: a very sinuous tiger, figured as they always were at this time, gazing at its own reflection in a mirror, which the hunters have thrown down to distract it from trying to retrieve its stolen cubs. An elephant, which has lost its head, but still has its emblematic howdah. A beaver, which oddly has a beak and looks like a bullfinch. You only know it is a beaver because it is curled up, having just chewed off its testicles. Beavers were hunted for their secretions, which were believed to be medicinal, and the standard bestiary story is that they gnawed their testicles off and presented them to the hunters to avoid being killed. It's chastening to think that even in the fens 600 years ago, the real appearance and habits of beavers were no longer part of either local experience or memory. Yet amongst these fabulous beasts there are also astonishing lively carvings of local natural history – of herons catching eels, of stags and swans.

Yet perhaps they are *not* local. Thirty years ago I saw the beautiful carvings of sycamore leaves on the shrine to St Frideswide of Oxford Cathedral, made in 1282, and quite clearly differentiated from the equally fine representations of maple, hawthorn and oak. This may be evidence of a much earlier arrival of sycamore in this country than is generally accepted. Yet it may just as well be an indication that the carver – and there were many itinerant continental craftsman roaming Britain at this time – knew the tree from elsewhere in Europe.

As I stressed all along, it is often a mistake to look literally at representations of nature in art and literature. Sometimes they may be indeed "drawn from life". But more likely they are clues to contemporary social and cultural attitudes, to artists states of mind, to the attempts they make to try and fit humans and other creatures together in some kind of moral scheme.

I'll end, if you will indulge me, with a bit of my own writing in which I've tried to make one kind of bridge between scientific and imaginative responses. It's about woodpeckers – which I was astonished to find in such abundance in the fens and commons of the Waveney Valley, (to the extent that green woodpeckers are now on my list of birds encountered *inside* the house!) It's about myths, and their value in trying to reconcile facts with human feelings:

For most of the past couple of months, the solid and reliable business behind the high jinks of the swifts and martins has been the procedures of the woodpeckers. They're everywhere. The great spotted are still coming to the pear tree, and must be nesting close to the garden. They haunt the fens, too, revelling in the rotting alder and willow trees. On the Ling, green woodpeckers, like small dragons with

their lime-velvet plumage and fiery tongues, bounce across the turf – and then bounce through the air, yelling and yaffling. Both species, maybe just two individual birds, love a particular telegraph pole just beyond the garden. They fly hard at it, in as near to beelines as their undulating flight will allow, and clamp themselves to the surface with the thump of abseiling rock-climbers. They're not feeding or probing in it, just playing sentinel, peering about, being peered at, using it maybe as a highly visible territorial look-out. Wherever I go I see one woodpecker or another, laughing, looping, levitating.

And for the third time in my life, by unspoken coincidence, they're becoming light-hearted billets-doux. I see a woodpecker and receive a message. Polly's thinking of me, and I of her.

Why should this idea have come spontaneously at different times to so many different people? Woodpeckers have an ancient history as harbingers. They were believed to foretell rain, the growth of crops, even the future. In the Gironde in France there is a folk-story about them as rain-seers. When God had finished creating earth, he ordered the birds to excavate with their beaks the hollows that would become the seas and lakes. All of them complied except the woodpecker, who refused to move. God's punishment was that, as the woodpecker was unwilling to peck the earth, she (sic) must for evermore peck wood. And that as she would have nothing to do with making cavities for water, she must drink nothing but rain. Hence the poor bird is forever calling to the clouds 'Plui, plui, plui', and, in flight and on the ground, forever pointing to the sky so as to gather in her beak the drops which fall.

Yet other myths, from Greece to eastern Europe, portray the green woodpecker (and the black) as fertility symbols, precisely because they *do* excavate the earth, while digging for ants. What lies behind these myths? An orthodox answer is that they are both examples of sympathetic magic. The fertility myth plays on the likeness between the green woodpecker's feeding technique and ploughing; the rain-bringing legends on the similarity between the spotted woodpecker's drumming and thunder. Sympathetic magic is often simplified to the formula of 'like cures (for generates) like'; but it is really a more comprehensive (and seemingly almost universal) approach to the search for order and connectivity in nature. At its heart is the idea of analogy, the ecological, the un-scientific', belief that the different layers of life are not only connected, but in some way physical reflections – metaphors, if you like – of each other. Exterior likenesses are clues to inner processes and likely resonances. The shape and colour of plants reveal their powers. The mating dances of animals, if mimicked by humans, will make the animals more prolific – and maybe the dancers too. The woodpecker thunders, and the heavens will thunder as well.

I'm far too twenty-first century to take seriously the idea that they either predict or procure rain. But they make me listen, and look up. The yaffling cry, the upward-tilted bill, the looping flights, the drumming, the flashing feathers, red and black and white – all things that caught the interest of our ancestors, catch us, too. The rhythms of the bird become the pattern in the brain. Our interpretations are more matter-of-fact now, maybe even flippant, but not entirely unsympathetic. Woodpeckers are birds of alert. They make us pay attention. They are exclamation marks, one half of a pair of crossed fingers. Of course, somewhere, someone else is also looking up, and crossing the other one.

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Damselfly takes conehead

P. J. Heath

3 Lock Cottages, Lock Road, Honing, North Walsham, Norfolk NR28 9PJ

Although to us they may look delicate, damselflies are voracious predators, taking a wide range of insect prey. On the 26th July 2005 I watched a Blue-tailed Damselfly *Ischnura elegans* pluck an early instar Short-winged Conehead *Conocephalus dorsalis* from vegetation by a dyke on Reedham Marshes, How Hill NNR. After carrying it a short distance it settled and ate its prey.

Swanton Novers Wood NNR, Norfolk, and its Coleoptera

Bryan Sage

Waveney House, Waveney Close, Wells-next-the-Sea, Norfolk NR23 1HU

INTRODUCTION

In his Presidential Address to the Norfolk & Norwich Naturalists' Society, Rackham (1986) commented on the great diversity of the county's woodlands and stated that of the 64 types of ancient woodland recognised in England at that time, 34 were represented in Norfolk. In some instances many types can be found in one woodland as at Swanton Novers Great Wood.

These form part of Swanton Novers Woods National Nature Reserve which comprises four blocks of ancient woodland totalling 83.4 hectares in extent: all are part of Swanton Novers Woods Site of Special Scientific Interest (SSSI) which was notified in 1968. Swanton Great Wood (TG0130 & 0131) and Little Wood (TG0031) were declared an NNR in 1974, in an agreement with Lord Hastings. Barney Wood (TF9832 & TF9932) was added in the 1980s, and Guybon's Wood (TG0033) in 1995. It should be noted that access to this reserve is restricted to permit only. The core of the reserve consists of the Great Wood (51 hectares) and Little Wood (8 hectares) and these are the subject of this paper. These two woods are now divided by a wide track but at one time may have been contiguous.

They are considered one of the most important woodland sites in lowland Britain and were included in the Nature Conservation Review (Ratcliffe 1977) as a Grade 1 site. They are thought to be mediaeval encoppicements which have never been completely cleared of ancient woodland. Whilst the Great Wood had been known for many years as a site of considerable interest to naturalists it (and Little Wood) was effectively "put on the map" by Dr George Peterken (1970) who said "*Having visited these woods on a number of occasions during the last year, and over a number of years seen woodlands throughout the British Isles, I have formed the opinion that Swanton Novers Great Wood, together with Little Wood, are one of the most important woods ecologically in the country.*" A paper by Goodfellow & Peterken (1981) details research undertaken to identify ancient woods in Norfolk and rank them for nature conservation purposes. Swanton Novers Woods proved to be by far the most important.

Both woods were once surrounded by a number of commons, all of which were long ago enclosed. On Faden's map of Norfolk (Barringer 1989) which was

surveyed from 1790-1794, the area between Fakenham and Holt is referred to as Stock Heath. This was a great mixture of coppiced woods (on the edge), wood-pasture and heathland. It is probable that from Saxon times onwards this area changed from woodland to heath (Gillian Beckett, *pers. com.*). This extensive heathland extended southwards to the vicinity of Guist, and Swanton Novers Woods were thus 'edge of heath woodlands'. Heathy remnants still survive in some of the wider rides in the Great Wood, as for example in Rides 60, 61 and 63, (see Figure 1).

Woodland Management

Archaeological features indicate that the woods are very old and records in the Doomsday Book show that for the last 1000 years coppicing has been practised. Part of the reserve is still managed as traditional coppice-with-standards, as can be seen in Little Wood and some of the compartments in the southern end of Great Wood. Other compartments, such as 8 and 10, were formerly also managed in this way but have not been coppiced for 80-100 years and are now high forest.

Topography

Swanton Novers Woods are located on the south-west end of the Holt-Cromer ridge and their altitude ranges between 60-98 metres and are close to the highest point in Norfolk at Piggs Grove. The ridge is composed of a considerable thickness of gravels, sands and clays lying over chalk. Although the wood slopes gradually to the south-west, it is dissected by many undulations, shallow valleys and sandy hillocks. These are assumed to be natural features and are believed to represent the natural land surface remaining after the last glaciation. If this is correct, then it follows that the soil profiles within the wood are likely to be natural and mostly undisturbed since that time.

Soils

The woods developed on these deposits range from heavy loams on the clays, to podsols with deep peaty humus on the freely draining acidic sands. In consequence pH levels are variable. There is chalky boulder clay in the southern part of the Great Wood, and sands and gravels in the north. Conditions in both these woods range from very wet to damp, and some parts remain at least damp throughout the year.

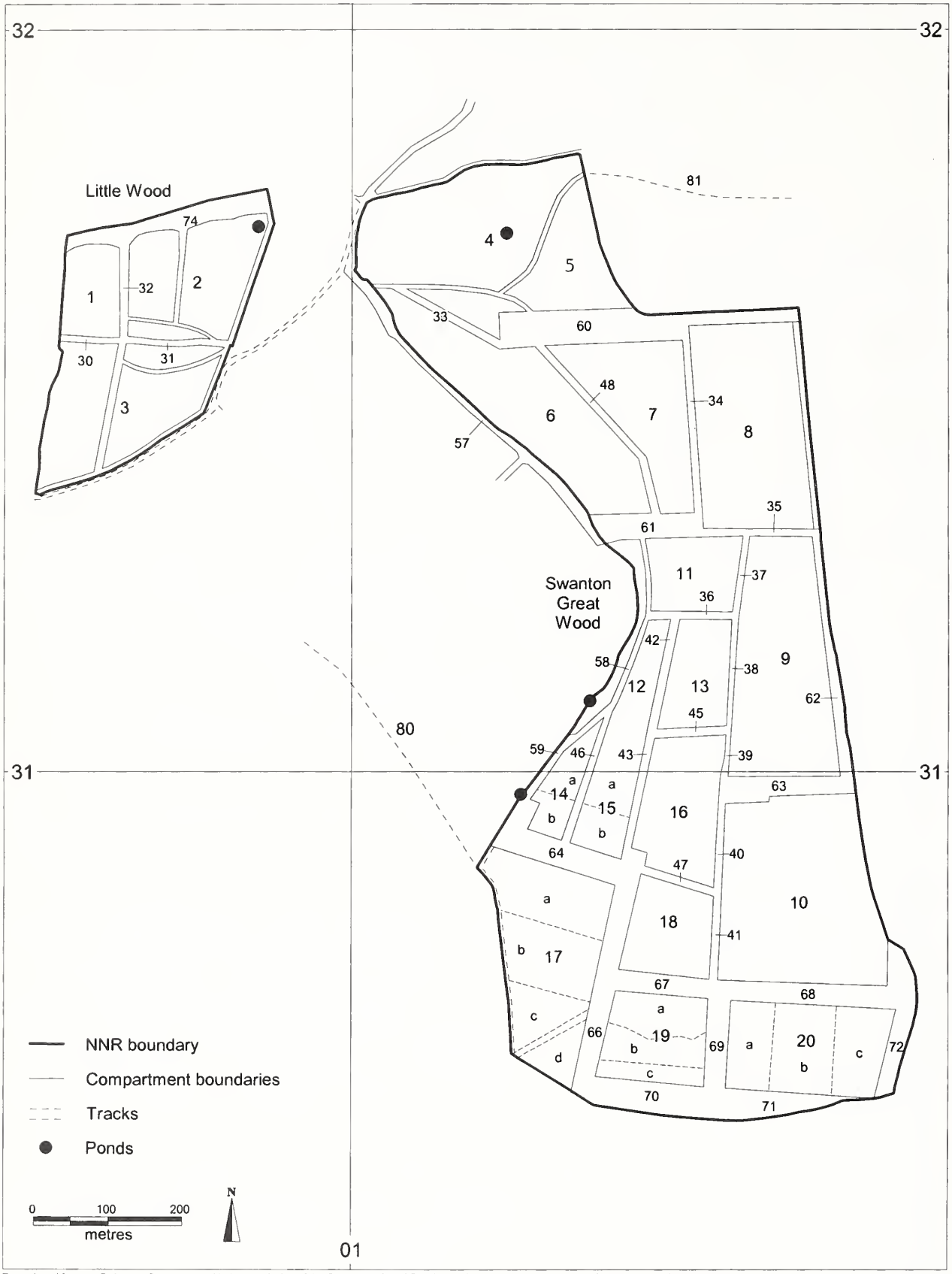
Precipitation

Compared with average amounts for Norfolk eg 621 mm per annum (1971-2000) for RAF Marham, 35km to the south-west, rainfall is relatively high because of its proximity to the north-facing coast and relative altitude. In the year May 2003 – April 2004, for instance, Swanton Novers had 692mm (Baker 2005).

ENGLISH NATURE

Swanton Novers NNR

Figure 1



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Ponds

There are numerous, mostly small, ponds in the general area some of which are the result of old clay diggings. A total of four ponds (three in Great Wood and one in Little Wood) have been studied in some detail, and the location of these is shown on Figure 1. There are two other ponds in Little Wood, one adjacent to Ride 32 (small and shallow) and the other in the south-west corner, but these have not been well studied.

In 1997 tests of the water in the Little Wood pond and the north and south ponds in the Great Wood gave pH readings of 5.5; the pond in Compartment 4 has not been checked. The latter is the largest pond in the Great Wood being some 20 metres across and 1.5 metres deep when full, but is usually completely dry by late summer. A ditch flows into the northern (Compartment 12) pond from the north. Water levels in all four ponds can vary from completely dry to brimming full. In the summer of 1997, for example, the three ponds in the Great Wood were dry throughout the summer. The Little Wood pond lies high on the water table and normally shrinks to a small puddle by late summer, and even in early spring is rarely more than half-full. In total some 23 species of aquatic plants have been recorded in these four ponds and the distribution of these is shown in Appendix 1. The pond in Compartment 4 in the Great Wood is quite different from the north and south ponds, being relatively shallow and saucer-shaped.

BIODIVERSITY

These two woods support a rich and diverse flora and fauna, a point emphasised by Peterken (1981) who stated that the unusually wide range of calcifuge plants was just one reason for rating this site highly.

Flora

The flora, excluding lichens and mosses, stands at 326 species, but this figure does include a few that have not been seen in recent years. In addition there are also some 15 microspecies of bramble. There are a number of species frequently associated with ancient coppice woodland, as for example Wood Anemone *Anemome nemorosa*, Bluebell *Hyacinthoides non-scripta*, Dog's Mercury *Mercurialis perennis*, Wood Sorrel *Oxalis acetosella*, Herb Paris *Paris quadrifolia*, Yellow Archangel *Lamiastrum galeobdolon*, and Lily-of-the-Valley *Convallaria majalis*. Until its recent discovery on Salthouse Heath, the Great Wood was the only known Norfolk site for the May Lily *Maianthemum bifolium*. In addition to the May Lily and Lily-of-the-Valley, there are a number of other species which are local or uncommon in their Norfolk distribution. Examples are Hard Fern *Blechnum spicant* (uncommon elsewhere in East Anglia), Green-ribbed Sedge *Carex binervis*, Pale Sedge *Carex pallescens*, Hairy Woodrush *Luzula pilosa*, Greater Woodrush *Luzula sylvatica* (common here but

confined to just a few sites elsewhere in Norfolk), Broad-leaved Helleborine *Epipactis helleborine* (not seen in the reserve recently, but found alongside the ancient hedge running to the west of the Great Wood in 2004), Water Purslane *Lythrum portula*, and Heath Cudweed *Gnaphalium sylvaticum*. The latter, found in the coppice area in Little Wood, is a nationally scarce species which at this site may be a heathy common remnant.

The generally acidic nature of these woods is clearly reflected in the number of calcifuge species such as Purple Moor Grass *Molinia caerulea,* Tormentil *Potentilla erecta*, Wood Sage *Teucrium scorodonia*, Thyme-leaved Speedwell *Veronica serpyllifolia*, Rowan *Sorbus aucuparia*, Sessile Oak *Quercus petraea* and, in the most acid sites, Climbing Cordyalis *Ceratocapnos claviculata.*

The occurrence of alkaline soils is indicated by the presence of a range of species which avoid really acid soils, these include False Brome *Brachypodium sylvaticum,* Wood Brome *Bromopsis ramosa*, Nettle-leaved Bellflower *Campanula trachelium*, Enchanter's Nightshade *Circaea lutetiana*, Germander Speedwell *Veronica chamaedrys*, Sanicle *Sanicula europaea*, Wild Privet *Ligustrum vulgare*, Dogwood *Cornus sanguinea* and Spindle *Euonymus europaeus*.

The narrow, heavily-shaded rides have limited botanical interest, whilst wider rides show considerably greater diversity, particularly if they are damp-wet. In the Great Wood, an example of the latter type is Ride 60 which supports an extensive stand of Wood Small-reed *Calamagrostis epigejos*, and Purple Moor-grass *Molinia caerulea* is also present. The latter species also occurs in Rides 61-63, and in Ride 61 Tufted Hair-grass *Deschampsia cespitosa* is also found.

The areas of waterlogged soils support a range of typical wetland species which include Great Horsetail *Equisetum telmateia*, Opposite-leaved Golden Saxifrage *Chrysosplenium oppositifolium* (both usually closely associated with spring lines), Hemp Agrimony *Eupatorium cannabinum*, Meadowsweet *Filipendula ulmaria*, Common Marsh Bedstraw *Galium palustre*, Water Avens *Geum rivale*, Skullcap *Scutellaria galericulata*, Yellow Flag *Iris pseudacorus*, Bird Cherry *Prunus padus* and Alder Buckthorn *Frangula alnus*. Some of the damp grassland rides, often resulting from seepages, have communities that are particularly interesting as none of them are specifically associated with woods. In the extreme south of the Great Wood, for example, is a seepage or flush community comprising Zig-zag Clover *Trifolium medium*, Devilsbit Scabious *Succisa pratensis* and Fragrant Agrimony *Agrimonia procera.* This community is quite uncommon in the county today except on a few remnants of commons in south Norfolk. These waterlogged soil communities in the open grassy areas may well

have been typical of wet sites on the great area of commons and heathland which formerly almost surrounded the woods.

Surveys of Bryophytes in the Great Wood carried out in 1986, 2000 and 2002 resulted in the discovery of 76 species. This is quite a high total and it may be that the Great Wood has the richest moss flora of any wood in the county. Foxley Wood (124 hectares) is also an ancient woodland and is in many respects similar to Swanton Novers Woods, and 69 species of moss have been recorded there. Insofar as lichens are concerned, a total of 35 species are known from Swanton Novers Woods.

The fungi have been very well studied and about 750 species have so far been recorded, whilst the comparable figure for Foxley Wood is 601 species. It seems likely that Swanton Novers Woods is the second most important wood in Norfolk for this group, exceeded only by Felthorpe Wood (a quite different type of woodland) which has about 761 species.

Fauna

Due to the intense amount of work on the lepidoptera in recent years this group has been well documented. The total number of moths recorded currently stands at 544 species, including 401 macros (Baker 2005), some 18% of which are local or Red Data Book species. The species recorded once again reflect the variety of habitats present within the woods. For example, the Dotted Fan-foot *Macrochilo cribrumalis* is a fen and marshland species with its stronghold in The Broads; the Mere Wainscot *Photedes fluxa* is a species characteristic of damp woodland and marshy places; the Small Waved Umber *Horisme vitalbata* is associated with chalky soils, and the pyralid moth *Pyrausta purpuralis* is a chalk grassland species. Specialities of the reserve are the Oak Lutestring *Cymatophorima diluta*, with Great and Little Woods being its only Norfolk site, though it is not uncommon elsewhere in the country, and the Red-necked Footman *Atolmis rubricollis* which is a lichen-feeder and a good indicator of ancient woodland. This is a canopy species and is seen regularly in small numbers in the Great Wood. It was first seen in Fulmodeston Severals early in July 1996, and one was found in the Great Wood on 20 July 1996. These were believed to be the first records for Norfolk in the twentieth century (Tunmore 1996).

Insofar as the butterflies are concerned, 29 species have been recorded in recent years and as a group they are a feature of the reserve. In 2003 for example, the total number of butterflies counted during surveys in the Great Wood was 4025 of 25 species (Baker 2003). One species, the Grayling *Hipparchia semele* is purely a vagrant. Two other species, Dingy Skipper *Erynnis tages* and Dark Green Fritillary *Boloria aglaja* now seem to have been lost as breeding species. Three further species, Small Heath *Coenonympha pamphilis*, Brown Argus

Aricia agestis and Green Hairstreak *Callophrys rubi* are currently classified as scarce. There seems little doubt that the Purple Emperor *Apatura iris* was formerly present in these woods, possibly into at least the 1960s. The relatively few records of this species in the county suggest a highly fragmented distribution. E.A.Ellis (1984) states that there had been reports of its presence (no dates given) in two localities in the north of the county, and Wild and Ashton (1997) suggest that one of these was probably Swanton Novers Woods. Their paper includes a colour plate of a ride in the Great Wood illustrating the decline of suitable habitat for female ovipositing Purple Emperors, with sallows on the edge of high forest being choked out by invasive birch.

The dragonflies (Odonata) are represented by 18 species, 14 of which breed on the reserve. Three species – the Black-tailed Skimmer *Orthetrum cancellatum*, the Banded Demoiselle *Calopteryx splendens* and the Yellow-winged Darter *Sympetrum flaveolum* are of casual occurrence only. In 2004 the Small Red-eyed Damselfly *Erythromma viridulum* was found in considerable numbers at a pond just outside the reserve boundary (Baker 2005), and in August 2005 four were seen at the Compartment 4 pond in the Great Wood. Since first recorded on the Norfolk coast in 2001 this species has rapidly spread inland in the county.

The beetles (Coleoptera) are discussed in detail below, but 501 species have been recorded up to the end of July 2005. In 1995 the slug *Limax cinereoniger* which is an ancient woodland species, was discovered in the Great Wood (Tunmore 1995). This large slug is very rare in East Anglia, and Swanton Novers Woods remains the only known Norfolk site.

The amphibian fauna associated with the ponds includes three species of newt – Great Crested Newt *Triturus cristatus*, Smooth Newt *T. vulgaris* and Palmate Newt *T. helvetica.* The latter has a western distribution in England, and the only other extant site in Norfolk is Bacton Woods, (John Buckley, *pers. com.*). Swanton Novers is in the area for historical records. Also, it is the only site in Norfolk with the three native species of newt and is clearly of considerable herpetological importance.

The reserve has a rich breeding bird fauna among which are Honey Buzzard (nests outside the reserve in some years), Sparrowhawk, Woodcock, Turtle Dove (now scarce having been in decline for several years), Lesser Spotted Woodpecker, Nightingale (last bred in 2002), Redstart (scarce), Firecrest, Marsh and Willow Tits, Redpoll, Bullfinch and Hawfinch (scarce). Common Buzzards are also present and have bred in the vicinity, if not within the reserve itself, and the same comment applies to the Crossbill.

The mammal fauna comprises 21 species which includes four species of deer and four of bats. The latter includes two species of pipistrelle, the Common

Little Wood (Compartment 3), Swanton Novers, May 2004. *Photo*: Bryan Sage.

Great Wood (Compartment 17), Swanton Novers, May 2005, showing Bluebells and Yellow Archangel. *Photo*: Bryan Sage.

Great Wood (Ride 45), Swanton Novers, 2005, showing extensive flooding. *Photo*: Bryan Sage.

Great Wood (Ride 64), Swanton Novers, 2005, showing abundant Great Wood-rush and Bird Cherry. *Photo*: Bryan Sage.

Pipistrelle *Pipistrellus pipistrellus*, and the Soprano Pipistrelle *P. pygmaeus*. In addition, Daubenton's Bat *Myotis daubentoni* has been seen over a pond just outside the reserve boundary.

THE ANCIENT WOODLAND CONCEPT

It is believed that some woods and wood-pastures were probably formed from remnants of the prehistoric forest or wildwood that was brought under management but never completely cleared of trees. Such sites are often referred to as primary woodland, but in practice it is very difficult to prove that any particular wood is primary. The term ancient woodland was introduced in order to overcome this problem, and is now generally taken to mean that woodland has been continually present on a site before a certain date. This date is usually taken to be A.D.1600, although Rackham (1980) suggests A.D.1700.

Are Swanton Novers Woods natural? Ratcliffe (1977) said "*It is almost certainly a primary woodland site and as such constitutes an important contrast with the more widespread type of oak-ash-maple-hazel primary woodland.*" Earlier, Peterken (1970) was in no doubt that they were natural -"*With minor exceptions, they consist of native tree and shrub species throughout which occur in mixtures, and the various woodland types corresponds with variations in soil properties, and do not follow management boundaries.*" The general consensus at one time was that Little Wood is very old secondary woodland, and that the southern and south-western parts of Great Wood primary woodland. However, the structure of Swanton Novers Woods is clearly artificial in that it still shows coppice-with-standards structure, even where coppicing has long been discontinued. The pattern of native tree and shrub species is natural in that, as mentioned above, their distributions are related to site conditions, although the relative amounts of different species will have been influenced by management history. It may be that the south and south-western sections of the Great Wood are not, as stated above, primary woodland but ancient secondary woodland, as is the case in Little Wood.

Ancient Woodland Vascular Plant Species

The use of vascular plants in evaluating ancient woods for nature conservation purposes is discussed in detail by Rose (1999), and he gives a table listing ancient woodland vascular plants (AWVPs) for four areas of southern Britain. One of these regions is East Anglia (Cambridgeshire, Essex, Norfolk and Suffolk). The total AWVPs listed for this area is 100, including one species found only in Essex and another only in Suffolk. However, this list is not universally accepted and in the purely Norfolk context is of limited value. A list of AWVPs applicable only to Norfolk has been drawn up by Gillian Beckett (*pers. com.*) and this contains 33 species:

Allium ursinum [a]
Anemone nemorosa
*Campanula latifolia**
Campanula trachelium
Carex pallescens
*Carex strigosa**
Carex sylvatica
Convallaria majalis [a]
Crataegus laevigata
Dryopteris affinis (ssp.*affinis*)
*Elymus caninus**
*Euphorbia amygdaloides** [b]
*Galium odoratum**
Geum rivale [c]
*Helleborus viridus**
Hyacinthoides non-scripta
Lamiastrum galeobdolon
Luzula pilosa
Luzula sylvatica
*Melampyrum cristatum**
Melica uniflora
Mercurialis perennis
Millium effusum
*Neottia nidus-avis**
Orchis mascula
Oreopteris limbosperma [a]
Oxalis acetosella [a]
Paris quadrifolia
*Platanthera chlorantha**
*Ranunculus auricomus**
Sorbus torminalis
Tilia cordata
Viola reichenbachiana

a Particularly in wood-pasture
b SE clays only
c Also in meadows
* Not present in Swanton Novers Woods

It can be seen that 23 (70%) of the species on this list are present in the woods at Swanton Novers. Four of these species, identified with an [a] in the list, are considered to have been particularly associated with ancient wood-pastures.

There are 10 species of vascular plants which are often found in ancient woodland but are not listed as Ancient Woodland Vascular Plant species:

Blechnum spicant
Cardamine amara
Ceratocapnos claviculata
Dryopteris carthusiana
Frangula alnus
Gnaphalium sylvaticum
Hypericum pulchrum
Melampyrum pratense
Polystichum aculeatum
Prunus padus

All of these, with the exception of *Melampyrum pratense*, are present in Swanton Novers Woods. In some other counties many of them are regarded as ancient woodland indicator species, but here in Norfolk they are closely associated with moist acid conditions on heaths etcetera. Some may be considered as survivors from the old commons and the former extensive Stock Heath.

WOODLAND TYPES

The first attempt at classifying and mapping the different types of woodland represented in Great and Little Woods was by Peterken (1970), and this work established a baseline for future research. Three main woodland types were distinguished in the Great Wood: (a) mixed coppice of various kinds found mainly in the southern part on clays and slightly acid sands. (b) oak high forest and coppice occupying the northern and eastern parts on acid sands; and (c) flush coppice-scrub of Bird Cherry and Alder *Alnus glutinosa* on the lower lying wet soils along flushed areas where these cross the acid and less acid sands, and in depressions elsewhere. The woodland types in Little Wood can be related to these with only minor adjustments: here a type of mixed coppice occurs which is dominated by Bird Cherry and Alder, but is not in a conspicuously flushed situation. This wood, however, lies close to a stream and is best regarded as flush woodland which has lost most of its direct contact with the surface drainage features. The integrity of this community depends on a constant high water table.

Two of these woodland types can be further subdivided. The oak woodland has a clear gradation from an extremely acid type in which the moss *Leucobryum glaucum* is the main ground flora species (this has declined in abundance in the last 10 years), to a less acid type in which Bracken *Pteridium aquilinum* is abundant. Subdivisions within the mixed coppice are less clear cut, but two variants can be related to the 'heavy soil' coppice and 'light soil' coppice typical of many East Anglian woodlands. The former has Small-leaved Lime *Tilia cordata*, Hazel *Corylus avellana*, Field Maple *Acer campestre*, Ash *Fraxinus excelsior* and willow *Salix* species as its main constituents, whereas the latter lacks Ash and Field Maple, whose place is taken by Rowan, oak *Quercus* species and Holly *Ilex aquifolium*. A third variant is one in which lime is absent, the main species being Hazel, birch *Betula* species, Rowan and willow. All these mixed coppice types and the flush woodland occur beneath an open layer of standard oak and, less commonly, Ash.

All these woodland types were mapped by ground survey and their distribution is shown in Figure 2 which is based on the original map in Peterken (1970). Although sharply defined on the map, it is important to realise that all these types of woodland merge into one another, forming a range of intermediate types. On Figure 2 the types shown are:

A Mixed coppice of Hazel, birch, Rowan and willow, but no lime.
B Mixed coppice of lime, Hazel, Ash, Field Maple and willow.
C Mixed coppice of lime and Hazel, with some willow, Rowan, oak and Holly.

D Flush woodland and mixed coppice of Bird Cherry, Alder and Hazel.
E Oak woodland of the slightly acid type with Bracken dominant in the ground flora, and birch, Rowan and Holly common as shrubs.
F Oak woodland of the acid type, with the moss *Leucobryum glaucum* dominating the ground flora.
X Conifer woodland.

About a decade later Peterken (1981) proposed a stand-type system for classifying woodland tree communities. This system classified ancient, semi-natural woodland into 58 stand-types and subdivisions, based on the main tree and shrub species, site characteristics, and soils. Once the types had been defined the ground flora of each was then described. This system was designed to be used at all seasons and required only an ability to identify the main trees and shrubs. Ground flora was deliberately excluded since it was considered that this needed a separate classification. This proved to be an eminently workable system and applying it to Swanton Novers Woods identified a total of 8 stand-types and sub-divisions, plus coniferous woodland. These are all shown on Figure 2.

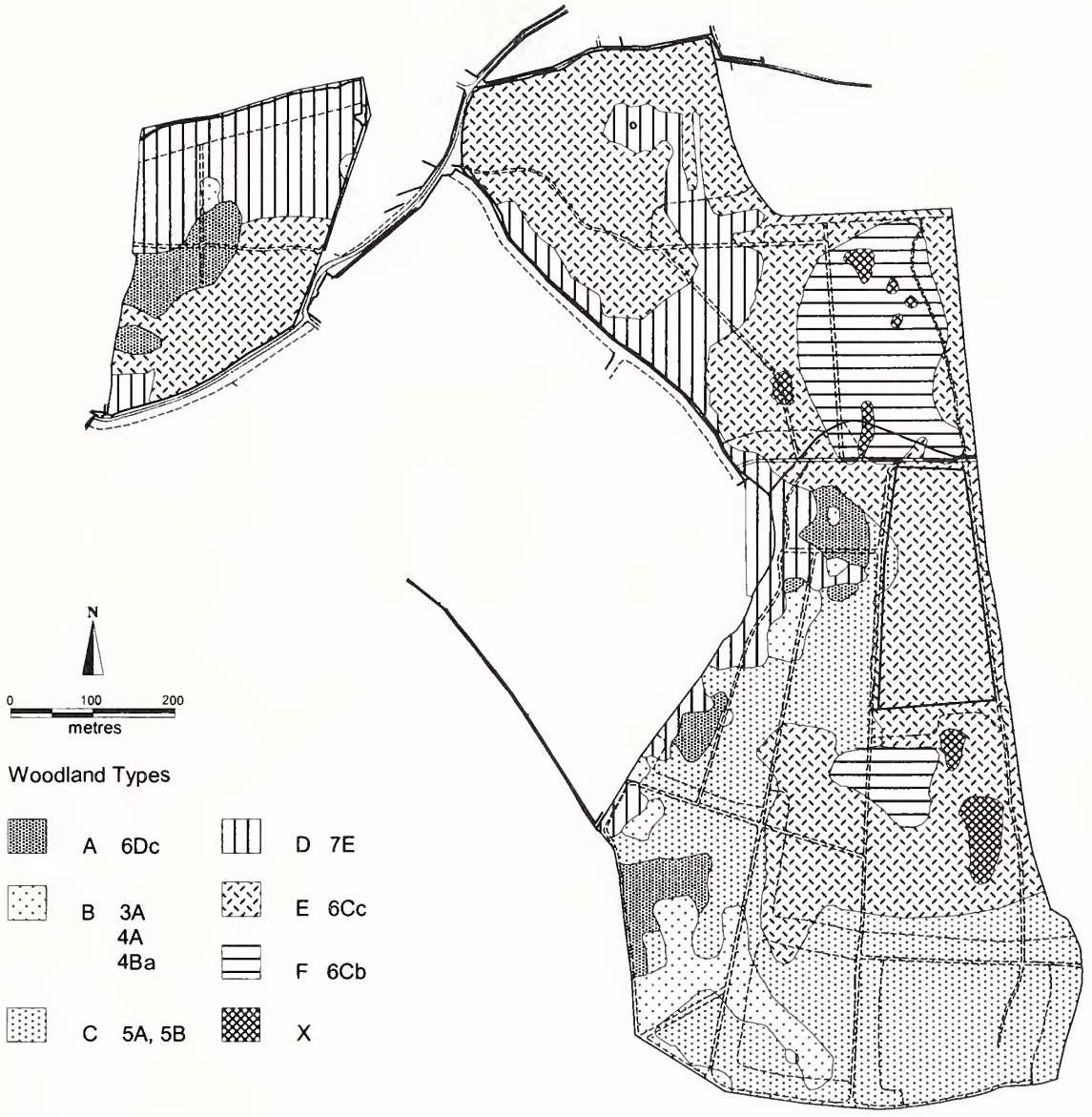
Ten years later came the launch of an entirely new system for classifying all British plant communities, this was the National Vegetation Classification (NVC). The first volume (Rodwell 1991) dealt with woodlands and scrub. This is a very different system to that of Peterken (1981). It is a rigorously floristic approach, defining woodland types by the plant species (including ground bryophytes) present in sample areas, and virtually ignoring other characteristics. As Rackham (2003) has pointed out, it is particularly defective for ancient woodland in which one third of the plants can easily be dormant in the seed-bank and thus escape detection.

The only attempt to apply the NVC to Swanton Novers Woods was by Cowie (1992) as part of his detailed research on the Wood Anemone. He identified a total of six NVC sub-communities arising from four main woodland types – W7c, W8a-b, W10a-b and W16a. Appendix 2, which is based on data supplied by Dr George Peterken, shows how the NVC categories relate to the Peterken stand-types. Whilst there is broad agreement, there is no completely 1:1 correspondence between a stand type and an NVC type. The shortcomings of the NVC when it is applied to ancient woodland can be clearly seen in Appendix 2 where no less than six Peterken stand-types are subsumed into the NVC community W10. The situation was aptly summarised by Rackham (2003) who says: "*However, the NVC gives the impression that those most ancient woods, despite their infinite variety and the numerous stand types already published, can be crammed into the categories* ***W8*** *and* ***W10*** *which include much recent woodland as well.*"

ENGLISH NATURE

Swanton Novers Woods, Norfolk

Figure 2



A. Mixed coppice of hazel, birch, rowan and willow. No lime.

B. Mixed coppice of lime, hazel, ash, maple and willow.

C. Mixed coppice of lime and hazel, with some willow, rowan, oak and holly.

D. Flush woodland and mixed coppice of bird-cherry, alder and hazel.

E. Oak woodland of the slightly acid type with Pteridium aquilinum dominant in the ground flora, and birch, rowan and holly common as shrubs.

F. Oak woodland of the acid type, Leucobryum glaucum dominating the ground flora.

X. Conifer woodland.

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It should be noted that Compartment 9, shown as oak woodland of the acid type on Figure 2, is now a larch plantation with an admixture of other species such as Beech *Fagus sylvatica,* Small-leaved Lime *Tilia cordata*, birch, oak, Rowan and Holly *Ilex aquifolium*. A single Hornbeam *Carpinus betulus* (formerly coppiced) is also present and may be the only example of this species on the reserve.

Holly is very much a feature of the Great Wood and is particularly evident in certain compartments such as 7, 8 and 11. It has increased greatly in recent years as part of the natural succession. It may be that the marked spread of Holly is a function of climate change, although it is likely that other factors are also involved. In closed-canopy conditions only shade-bearers regenerate and on the light, acid soils such as are found in Swanton Novers Woods, that comprises Holly and Rowan. Scots Pines, originally planted, are present in scattered stands particularly in Compartments 8 and 10. Most of these trees are now quite large and some may be 100-120 years old. There is little evidence of any natural regeneration.

FEATURES OF INTEREST

If the oak woodland of the acid type, with *Leucobryum glaucum* dominating the ground flora (stand type 6Cb) at Swanton Novers Woods is viewed in the context of all British woodlands, then it is seen to be an example of lowland ancient encoppicements at the extreme acid end of their range of variation. The oak coppice at Swanton Novers (see Figure 2) is on extremely acid soils (pH 4.1), almost the most acid yet found in the coppices of East Anglia and the Midlands, and it is only in north Norfolk and central Lincolnshire that the variant of 'light soil' coppice with a permanently high water table has been found. Both superficially and structurally this type of coppice resembles the oak coppices of central Wales and the Cornish peninsula, but the ground flora is, of course, quite different (Peterken 1970).

Woodlands where both oak species occur as an intimate mixture are rare in East Anglia. In Norfolk, the five known oakwoods coincide with the five sites for indigenous Sessile Oak *Quercus petraea* (Rackham 2003). There are some coppices with Sessile Oak in Essex and central Lincolnshire, and in the latter Sessile Oaks *Quercus petraea* are mixed with Pedunculate Oaks *Quercus robur* rather like Swanton Novers. Woods in which both species occur in distinct zones are unusual but not uncommon in Britain, but true mixtures are rare. Sherwood Forest in Nottinghamshire is a fine example. The presence of Sessile Oak at Swanton Novers is clearly unusual, but ecological evidence favours the conclusion that it is indeed native there, in that although it is mixed with Pedunculate Oak the bias in the mixtures precisely reflects the known ecology of the two species – Pedunculate Oak favours the more calcareous, poorly drained

sites, and vice versa. In Eastern England generally, Sessile Oak is strongly associated with ancient woodland. Oliver Rackham (1980), considered Sessile Oak to be native in three localities in Norfolk – Swanton Novers Great Wood, Edgefield Little Wood and Thorpe Wood. As a result of fieldwork in 1983, Rogers (1984) suggested that three further sites be added to the list – Hull Wood (Glandford), Holt Wood and Upper Sheringham. He also thought that Bacton Wood and Haveringland Park were probably once sessile oakwoods of considerable antiquity. From the studies carried out it is clear that the Sessile Oak is restricted to well-drained acid soils.

Small-leaved Lime *Tilia cordata* is native in just a few ancient woodlands in Norfolk, and is an important tree in Swanton Novers Woods. There are three small and widely separated stands of a combination of Small-leaved Lime *Tilia cordata* and Sessile Oak *Quercus petraea* (stand type 5B) in the Great Wood (Rackham 2003). The same author also mentions an aggregate lime stool measuring 8.3 metres across.

The flush woodland at Swanton Novers (see Figure 2) with both Alder and Bird Cherry, is closely related to streamside woods of northern Britain. In the Great Wood, Bird Cherry *Prunus padus*) sometimes extends into the lime woodland. Norfolk is at the southern limit of the natural range of Bird Cherry in England. Also, as Rackham (1986) pointed out, the plateau alderwood found at Swanton Novers is an East Anglian speciality. It was also recorded at medieval Hindolveston.

THE BEETLE FAUNA

The total number of species recorded in Great and Little Woods at the end of August 2005 was 500 in 54 different families (see Appendix 3) where, for ease of reference, both families and the species within each family, are listed in alphabetical and not taxonomic order. It may be noted that the former family Scolytidae is now included in the Curculionidae, and in Appendix 3 is placed at the end of that family under the heading Scolytinae; the former family Pselaphidae is now included in the Staphylinidae and in the appendix is placed at the end of that family under the heading Pselaphinae, and the Bruchidae are now placed in the Chrysomelidae and in the appendix are shown at the end of that family under Bruchinae. The family with the highest number of species is the Staphylinidae (89 = 18%), followed by the Curculionidae (65 = 13%), Carabidae (52 = 10%), Chrysomelidae (40 = 8%) and the Dytiscidae (31 = 6%). However, as mentioned later, the total number of water beetles (51 in 8 families) represent 10% of the total of the 500 species recorded.

The total of 500 includes 34 species that are rare or scarce, and these are identified in Appendix 3. Using Hyman & Parsons (1992 & 1994) as the reference point these fall into the following categories:

RDB1 (Endangered)
Ernoporus caucasicus
RDBK (Insufficiently known)
Cryptophagus micaceus
Nationally Notable (Scarce)
Category A
Agrilus pannonicus
Longitarsus parvulus **
Poecilium alni

RDB2 (Vulnerable)
Diaperis boleti
Nationally Notable (Scarce)*
Gyrophaena lucidula
Nationally Notable (Scarce)
Category B
28 species (see Appendix 3)

* Occurring in 16-100 10 kilometre squares.
** This species has become more common and widespread and may be removed from this category when a review takes place.

One of the Category B species, *Baeckmanniolus dimidiatus*, is normally found in sandy coastal habitats and is clearly only a vagrant in Swanton Novers Woods. One was taken in a flight interceptor trap in the Great Wood on 18th April 1995.

Beetles play an important part in the woodland ecology, particularly those that have a direct impact on the tree species within the wood. Their role can be easily appreciated if the relevant families represented at Swanton Novers Woods are grouped in accordance with their different life styles:

Defoliators Adults or larvae, or both, feed upon the foliage of trees.

ATTELABIDAE	weevils
CHRYSOMELIDAE	leaf beetles
CURCULIONIDAE	weevils

Seed-borers Larvae feed on the seeds of trees.

CURCULIONIDAE	nut weevils

Bark-borers Adults and larvae feed and bore between the bark and wood of trees.

CURCULIONIDAE	weevils
CURCULIONIDAE (Scolytinae)	bark-beetles

Wood-borers Adults and larvae feed and bore in the wood of trees.

ANOBIIDAE	furniture beetles
BUPESTRIDAE	jewel beetles
CERAMBYCIDAE	longhorn beetles
CURCULIONIDAE (Scolytinae)	'ambrosia' beetles
ELATERIDAE	wireworms or click beetles
LUCANIDAE	stag beetles

LYCIDAE	powder-post beetles

Root-feeders Larvae feed upon the roots of trees.

CURCULIONIDAE	weevils
ELATERIDAE	click beetles (larvae known as wireworms)
SCARABAEIDAE	chafers, May bugs

In addition to the above, one species in the weevil family Apionidae feeds upon the female catkins of birch trees, and this will be mentioned later.

Other species play a variety of different roles in the woodland ecology. Many weevils for example, including most of those in the families Apionidae and Curculionidae, occur on herbaceous plants, as do many of the Chrysomelidae. There are also many phytophagous species in other families. Several families include many predatory ground-living species where the adults or larvae, or both, feed upon other insects (e.g. Carabidae, Coccinellidae, Nitidulidae, Silphidae and Staphylinidae). Almost every other ecological niche is exploited by beetles including, for example, vegetable refuse and leaf litter, fungi, carrion, dung and moss, and examples of these are listed later.

Within the Carabidae are several species normally found only on moist or wet ground near freshwater and should therefore be looked for at the edges of the ponds – *Acupalpus consputus, Agonum albipes, Bembidion articulatum, B.dentellum, B.doris* (very hygrophilous), *B.varium, Chlaenius vestitus, Elaphrus cupreus, E.riparius,* and *Stenolophus mixtus*. Others in this family are characteristic of moist shady places, often amongst leaf litter – *Cychrus caraboides, Leistus fulvibarbis, L.rufescens, L.spinibarbis, Loricera pilicornis* (often near water), *Notiophilus rufipes, Patrobus atrorufus, Pterostichus cupreus, P.nigrita* (usually near water), and *P.strenuus*. Four species in the Staphylinidae are particularly associated with marshy places – *Philonthus quisquilarius, Stenus bimaculatus, S.cicindeloides* and *S.flavipes.*

Two other species merit comment in the light of their habits. The first is *Dendroxena quadrimaculata* (Silphidae) which can be found on trees at night feeding on lepidopterous larvae. The second is *Glisrochilus hortensis* (Nitidulidae) which frequents the tunnels of bark beetles and some weevils where it feeds on the eggs and larvae of these insects. The large weevil *Barynotus moerens* (Curculionidae) which is usually found on Dog's Mercury is of particular interest. After a gap of 110 years since the last Norfolk record, the writer took a specimen in Sporle Wood on 6 May 2001 (Sage 2002). Subsequently I found it at Horningtoft Wood on 25 April 2002, Foxley Wood on 27 April 2002, and then in Swanton Novers Great Wood on 24 April 2004 where there were nine on Dog's Mercury.

In addition to collecting beetles by beating and sweeping, both pitfall traps and flight-interceptor traps have been used in the woods and have demonstrated just how numerous some species can be. Pitfall traps were used by Mark Tunmore in 1995, and in the Great Wood from July-September *Glisrochilus hortensis* accounted for 25% of the 889 beetles trapped. In Little Wood in the same period it accounted for 41% of the 190 beetles trapped. The writer deployed some pitfall traps in Great Wood in from 24th April -11th May 2004, and when examined on 5 May the same species dominated the catches: 92 in three traps in Compartment 4, 118 in three traps in Compartment 8, 85 in two traps in Ride 63 and 78 in three traps in Ride 72. Certain of the burying beetles (Silphidae) are sometimes common and were often caught in moth traps operated by Robert Baker. For example, *Nicrophorus humator* was very common and widespread in the Great Wood between mid-May and mid-August 1999, up to 21 per night were caught in a moth trap in Compartment 8. Other species in this genus appear to be less common, except possibly *N. vespilloides* with 33 taken in a pitfall trap in Ride 60 in the Great Wood on 2 July 1997 (Baker), and 30 in a flight-interceptor trap operated by the writer in Little Wood on 20 August 1995.

Water Beetles

Swanton Novers is an unusual wood in that it has a diverse water beetle fauna of 51 species from 8 different families (see Appendix 3), that is nearly 11% of the total number of species of beetle recorded there. The great majority of these, 46 species, are associated with the four main ponds or the flooded wheel ruts (see Appendix 4). The remaining five species include *Hygrotus impressopunctatus* that was taken in Great Wood on 23rd June 1999 with no exact site recorded, but it is a species of ponds and drain vegetation. The remaining four species were all taken in the stream in Little Wood and these are *Agabus didymus* found on 9th July 2003, *Anacaena globulus* in June 1999, *Elmis aenea* and *Hydraena testacea* on 25th October 2001. It must be pointed out that although *Agabus guttatus* is listed in the appendix under the Little Wood pond where it was taken on 23rd June 1997, it is not a pond species and had probably wandered from the nearby stream. This stream has its source in the NE corner of Little Wood close to the pond shown on Figure 2. It then flows westwards to join the River Stiffkey which has its headwaters at the western edge of Neat's Close a short distance to the north.

As mentioned earlier, the small pond on the eastern edge of Ride 32 in Little Wood has not been studied in detail, mainly because for some years it was choked with willows and Yellow Flag, and although later cleared it is often dried out. Nine species of water beetle have been recorded there from time to time – *Agabus bipustulatus* on 23rd March 2002, *Anacaena lutescens* and *Helophorus brevipalpis* on 28th June 1997, *H.minutus* on 2nd May 1999, *Hydroporus gyllenhalii* and *H.planus* on 23rd March 2002, *H.nigrita, H.palustris* and

Laccobius colon on 28th June 1997. In the case of *Hydroporus nigrita*, the only other records for the wood are from the flooded wheel ruts (see Appendix 4).

It is of interest to note that whilst the north and south ponds in Great Wood have the richest water beetle fauna with 23 species each (see Appendix 4), it is the pond in Compartment 4 that has the richest aquatic flora (see Appendix 1).

Insofar as habitat preferences are concerned there are five species which, according to Friday (1988), are normally confined to acid waters. These are *Anacaena lutescens, Hydroporus gyllenhalii, H.neglectus, Ilybius chalconotus* and *Ilybius montanus*. However, none of these species are in fact restricted to acid habitats, and even *I.montanus* which is the most acid-loving of them all can be found in calcareous habitats. A total of 39 species have been recorded in one or other of the four main ponds, but only 11 species have been found in all of these, (see Appendix 4). Two species, *Laccobius bipunctatus* and *L.striatulus*, were found in mud by the south and north ponds respectively, and this is their usual habitat. Perhaps the most interesting feature of the water beetle fauna is the 13 species associated with the flooded wheel ruts. These include nine species of *Hydroporus*, four of which *(H.incognitus, H.melanarius, H.neglectus* and *H.pubescens*) have not been found in any of the ponds. One of these, *H.melanarius*, is an uncommon species in Norfolk where it is confined to shallow acidic pools. The remaining five species of *Hydroporus* (*H.gyllenhalii, H.memnonius, H.nigrita, H.planus* and *H.tessellatus*) recorded in the ruts have also been found in ponds. One species of *Ilybius, Ilybius montanus*, has been found only in the wheel ruts along with *Ilybius chalconotus* which also occurs in the ponds. The most productive ruts are those in grassy rides which have carpets of water starwort *Callitriche* species. This leaves a further two species common to both ruts and ponds – *Agabus bipustulatus* and *Hydrobius fuscipes.* The total number of species recorded in the four main ponds is 38, of which 33 have been found only in that habitat. The distribution of species within the various aquatic habitats can be summarised as follows:

Ponds only	Ponds & ruts	Ruts only	Stream	TOTAL
33 [a]	7 [b]	6 [b]	4	50

a Includes *Agabus guttatus* normally found in running water (see above).
b See remarks concerning *Hydroporus nigrita* above.

Four species warrant further mention from the habitat viewpoint: *Haliplus lineatocollis* found in the Compartment 4 and Little Wood ponds is said by Friday (1988) to occur mainly in slow-running water; *Hydroporus erythrocephalus*, found in all four ponds, is a species of marshy habitats and peat mosses in pools (Friday *op. cit.*); *H.incognitus*, found only in the ruts, is known to

occur in peaty water in woods (Friday *op. cit.*); and *H.melanarius*, also found only in the ruts, is said by Friday to occur in peat mosses, but in point of fact also inhabits ponds and lakes.

Saproxylic Beetles

In recent years there has been an increasing appreciation of the significance of dead-wood habitats, whether they be old trees with decaying wood or fallen dead trees. Invertebrates that develop in timber and the products of its decay are termed saproxylic species. The term was defined by Speight (1989) as "*...species of invertebrate that are dependent, during some part of their life cycle, upon the dead or dying wood of moribund or dead trees (standing or fallen), or upon wood-inhabiting fungi, or upon the presence of other saproxylics.*" This definition was deliberately generalised and raised some practical problems in its application. It was, therefore, expanded and refined by Hammond & Owen (unpublished MS) as follows "*...species that are dependent, during at least some part of their life cycle, upon dead or dying wood of usually over-mature, damaged or dead trees (standing or fallen), upon wood-inhabiting fungi, or upon other species associated with this habitat.*" This refined definition was then further modified by Fowles *et.al.* (1999) to embrace a list of species that are dependent upon microhabitats associated largely with the processes of decay in the bark of wood and trees and larger woody shrubs and climbers. This includes sap runs, fungal hyphae or fruiting bodies, rot holes etc. The species used in evaluation should be obligate saproxylics, and hence facultative species that are not primarily associated with such habitats (such as generalised birds' nest inhabitants or fungus feeders) are excluded. The authors list some further exclusions, the most important being beetles occurring widely in woodland fungi (some staphylinids for example); only those believed to occur primarily in bracket or other dead-wood fungi are recognised. An important contribution to this subject was made by Alexander (2000) who lists all the invertebrates known to be dependent on decaying wood in Britain (1792+ species) and Ireland (615+ species). The number of species of beetle listed for Britain is 690 (not 700 as stated in the publication). However, for the purposes of calculating the Saproxylic Quality Index (SQI) it is the paper by Fowles *et.al.* (1999) which is relevant. This lists 599 species, later reduced to 598 by the removal of *Anoplodera livida* (Cerambycidae) that had been included in error. The difference in numbers between these two publications is due to the fact that Alexander (*op. cit.)* listed any beetle species associated with decaying timber and its products, whereas the SQI only utilises species that are strictly dependent upon saproxylic habitats.

The most important habitats for saproxylic beetles are long established sites such as ancient woodlands, old wood pastures, wooded commons, and medieval

parks. Swanton Novers Woods clearly fall within this category. Very few sites in Norfolk have been studied in sufficient detail to allow calculation of a SQI, but one exception is Felbrigg Great Wood and the associated park. The wood itself is ancient beech forest with a closed canopy over large areas, but mixed with the beech are some oak and holly.

Where open pockets occur birch has regenerated. The park is ancient open oak woodland with some old sweet chestnut and sycamore, and pasture that has never been ploughed. Felbrigg Great Wood has an SQI of 377.6 and is thus a high quality site for saproxylic beetles. As a habitat-type it is, however, quite different to Swanton Novers Woods.

The Swanton Novers Woods beetle fauna includes 72 qualifying saproxylic species which are listed in Appendix 5, which also shows the year in which the species was first recorded, the rarity score for each species (see below), and ecology (based on Alexander 2002).The list includes two species – *Arhopalus rusticus* (Cerambycidae), and *Hylobius abietis* (Curculionidae) – which are associated with Scots Pine. Since conifers are alien in the ancient broad-leaved woodland at Swanton Novers the species associated with them are excluded when calculating the SQI for this habitat-type. The SQI is calculated by totalling the rarity scores for the saproxylic species recorded from a site, dividing the total by the number of saproxylic species recorded, and multiplying by 100. For Swanton Novers Woods the total rarity score is 271 for 72 species, giving an SQI of 376.4, slightly below the SQI of 377.6 for Felbrigg Great Wood. Swanton Novers is clearly a very important site in Norfolk on the basis of our present knowledge. The most closely comparable site in habitat terms is Foxley Wood for which there is insufficient data to calculate the SQI.

There are SQI rankings for a total of seven sites in East Anglia (Cambridgeshire, Essex, Norfolk & Suffolk) which allows Swanton Novers to be viewed in a wider context:

Wimpole Estate, Cambs.	562.6	Wicken Fen, Cambs.	400.0
Hatfield Forest, Essex	557.1	Felbrigg Great Wood, Norfolk	377.6
Staverton Park, Suffolk	473.6	Swanton Novers Woods, Norfolk	376.4
Stanford PTA, Norfolk	454.1		

It should be noted that in calculating SQIs historical records, taken to be pre-1980, are not included.

There are a number of these saproxylic species that warrant comment. The cerambycid *Arhopalus rusticus* is a Scottish pine forest species that has spread widely in coniferous plantations across England. The most interesting of all is the bupestrid *Agrilus pannonicus,* a species which formerly had a classic ancient woodland refuge distribution in Britain, being known from the New Forest in

Hampshire, Windsor Great Park and Forest, Berkshire, and Sherwood Forest in Nottinghamshire. An increase in abundance in the early 1980s was subsequently boosted by the violent storms of the late 1980s, and the recent appearance of oak die-back disease. As a result the species is now widespread across south-eastern England and is being regularly reported from the north and west of the country (Alexander 2003). Another point of interest relates to the light that the presence of certain species throws on the ancient woodland concept. There is currently a school of thought which holds the view that original natural woodland was actually a form of wood-pasture, kept open by large wild herbivores (Vera 2000). Many of the species recorded in Swanton Novers Woods seem to support this view, and others are clearly associated with ancient woodland. The scolytid *Ernoporus caucasicus*, for example, is generally accepted as being a relict wildwood species, and the staphylinid *Coryphium angusticolle* may occur only in ancient sites. Another 14 species are also associated with ancient woodland (AW) and/or ancient wood-pastures (AWPs), as shown below:

Species particularly associated with AWPs

Ampedus quercicola
Bitoma crenata
Conopalpus testaceus
Eledona agricola

Species primarily associated with AW and AWPs

Agrilus pannonicus
Cerylon ferrugineum
Cerylon histeroides
Enicmus rugosus
Melandrya caraboides
Mycetophagus piceus
Phymatodes testaceus
Sinodendron cylindricum

Species primarily associated with AWPs

Hallomenus binotatus
Prionychus ater

Host Plants

Whilst many beetles are polyphagous (i.e. utilising a wide range of food sources) others are phytophagous (feeding on plants) which may be trees, shrubs or herbs. Some may be found on more than one species of plant, whilst at the other extreme many species are host specific and are not normally found in the absence of the host species. The plant/beetle relationships in Great and Little Woods are set out below, starting with the trees and shrubs. It should be noted that species already dealt with in the section on saproxylic beetles are not included here:

TREE or SHRUB	BEETLE
Alnus glutinosa ALDER	*Deporaus betulae*
Betula spp. BIRCHES	*Anoplus plantaris*
	Apion simile
	Caenorhinus mannerheimi
	Cryptocephalus pusillus
	Deporaus betulae
	Orchestes rusci

Corylus avellana HAZEL	*Apoderus coryli*
	Curculio nucum
	Polydrusus pterygomalis
Crataegus monogynya HAWTHORN	*Anthonomus bituberculatus*
	Neoceonorrhinus aequatus
Cytisus scoparius BROOM	*Apion fuscirostre*
	Apion immune
	Bruchidius villosus
	Philorinum sordidum
	Polydrusus confluens
	Sitona regensteinensis
Pinus sylvestris SCOTS PINE	*Anatis ocellata* [a]
	Aphidecta obliterata [b]
	Exochomus quadripustulatus
	Harmonia quadripunctata
	Tytthaspis 18-guttata
Populus tremula ASPEN	*Crepidodera aurata*
	Crepidodera aurea
	Crepidodera fulvicornis
	Dorytomus dejeani
Prunus spinosa BLACKTHORN	*Neoceonorrhinus aequatus*
	Phyllobius oblongus
Quercus spp. OAKS	*Archarius pyrrhoceras*
	Attelabus nitens
	Coeliodes rana
	Curculio venosus
	Neoceonorrhinus aeneovirens
	Polydrusus pterymogali
	Pseudoradonia livida
Salix spp. WILLOW	*Archarius salicivorus*
	Crepidodera aurata
	Crepidodera aurea
	Crepidodera fulvicornis
	Dorytomus salicinus
	Dorytomus taeniatus
	Lochmaea capreae
	Phratora vulgatissima
	Ramphus pulicarius
	Tachyerges salicis
	Temnocerus longiceps
	Temnocerus nanus
Ulex europaeus GORSE	*Apion ulicis*
	Philorinum sordidum
	Polydrusus confluen
	Sitona regensteinensis

a Only known to breed on this species.
b Also occurs on LARCH *Larix* spp.

HERBACEOUS PLANT	BEETLE
Alliaria petoliata GARLIC MUSTARD	*Ceutorhynchus constrictus*
Anemone nemorosa WOOD ANEMONE	*Leisoma deflexum*
Ballota nigra BLACK HOREHOUND	*Meligethes ruficornis*
Calluna vulgaris HEATHER	*Lochmaea suturalis*
	Micrelus ericae
Cardamine amara LARGE BITTER-CRESS	*Phyllotreta tetrastigma*
Centaurea spp. KNAPWEEDS	*Cassida vibex*
Cirsium spp. THISTLES	*Agapanthia villoviridescens*[c]
	Apion carduorum
	Cassida rubiginosa
	Neocrepidodera transversa
	Sphaeroderma rubidium
Epilobium spp. WILLOWHERBS	*Altica palustris*
Filipendula ulmaria MEADOWSWEET	*Galerucella tenella*[d]
Hedera helix IVY	*Liophloeus tessulatus*
Iris pseudacorus YELLOW IRIS	*Aphthona nonstriata*
Lotus corniculatus BIRD'S-FOOT-TREFOIL	*Apion loti*
	Bruchus loti[e]
	Meligethes carinulatus
Medicago lupulina BLACK MEDICK	*Sitona humeralis*
Mentha aquatica WATER MINT	*Cassida viridis*
Mercurialis perennis DOG'S MERCURY	*Apion pallipes*
	Barynotus moerens
Plantago spp. PLANTAINS	*Mecinus pascuorum*
	Rhinoncus pericarpius
	Trichosirochilus troglodytes
Rorippa nasturtium-aquaticum WATER-CRESS	*Drupenatus nasturtii*
Rosa spp. ROSES	*Meligethes atrata*
Rumex spp. DOCKS	*Apion hydrolapathi*
	Hypera rumicis
Scutellaria galericulata SKULLCAP	*Cionus scrophulariae*
Senecio jacobaea COMMON RAGWORT	*Longitarsus jacobaea*
	Olibrus corticalis[f]
Solanum dulcamarae WOODY NIGHTSHADE	*Epitrix pubescens*
	Psylliodes dulcamarae
Stachys sylvatica HEDGE WOUNDWORT	*Meligethes brunnicornis*
Trifolium spp. CLOVERS	*Apion apricans*[g]
	Apion assimile[g]
	Apion fulvipes[h]
	Apion virens[h]
	Hypera zoilus[g]
	Meligethes nigrescens[h]
	Sitona humeralis
	Sitona lepidus
Tripleurospermum inodorum SCENTLESS MAYWEED	
	Apion hookerorum[i]
Urtica dioica STINGING NETTLE	*Brachypterus urticae*

	Nedyus quadrimaculatus
	Neocrepidodera transversa
	Parethelcus pollinarius
	Phyllobius pomaceus
Veronica beccabunga BROOKLIME	*Phaedon armoraciae*
	Prasocuris junci
Vicia spp. VETCHES	*Apion vorax* [j]
	Sitona suturalis [k]

c *Cirsium palustre* is the preferred host plant.
d Also occurs on *Potentilla* spp.
e Also occurs on other *Lotus* spp.
f Also occurs on other species in this genus.
g Mainly found on *Trifolium pratense.*
h Mainly found on *Trifolium repens.* May also occur on *Matricaria* spp.
i Usually found on *Vicia cracca.*
j Usually found on *Vicia* sepium; also occurs on *Lathyrus pratensis.*

There are a further six species not listed above that require comment. The occurrence of the chrysomelid *Donacia semicuprea* in the Great Wood, where two were found in a pitfall trap in Ride 52 on 10 June 2004 is interesting. The usual food-plant of this species is Reed Sweet-grass *Glyceria maxima,* which has not been recorded in these woods, although its close relative Floating Sweet-grass *G.fluitans* is present at the north end of Ride 37 and in the upper pond in Little Wood. Similarly, *Donacia simplex,* taken in Ride 60 on 1st July 2005, is normally found on species of bur-reed (*Sparganium)* which are not known from any of the aquatic habitats in the woods. The weevil *Ceutorhynchus obstrictus* which was swept from Dog's Mercury in Ride 70 in Great Wood on 24 April 2004, is usually found on *Brassica* spp., a genus which is not represented in the woods. The weevil *Sitona cylindricollis* (Great Wood 24 April 2004, swept in Ride 61, and 23 June 2004 in pitfall traps in Compartment 8 and Ride 38) is normally associated with species of *Melilotus*, a genus not represented in these woods. Within the family Scarabaeidae is the subfamily Melolonthinae which comprises the chafers. One of these, *Amphimallon solstitialis*, is known as the Summer Chafer. It was commonly taken in moth traps at Swanton Novers in July-August 1999 (Baker), but has not been recorded since. It is a species mainly associated with coastal areas. Finally, another chafer, *Serica brunnea*, for which there are many records from these woods, is a characteristic species of sandy and chalky areas.

Among those species not so far mentioned are a number associated with other ecological niches. It should be noted that some species, such as *Philonthus splendens*, occur in more than one category.

Carrion

There are 10 species in this group which includes several generally referred to as burying beetles. Most of the species in this group are highly likely to be found in flight interceptor, moth or pitfall traps, rather than at carrion:

Catops grandicollis
Catops nigrita
Creophilus maxillosus
Hister impressus
Nicrophorus humator
Nicrophorus investigator
Nicrophorus vespillo
Nicrophorus vespilloides
Oiceoptoma thoracicum
Thanatophilus rugosus

Fungi

Thirteen of the 31 species in this group belong to the family Staphylinidae, one, *Gryophaena lucidula*, was mentioned earlier in the section on saproxylic beetles and is listed in Appendix 5. One other species in this group, *Enicmus rugosus,* is associated with slime-moulds (myxomycetes):

Amphicyllis globus
Anisotoma humeralis
Autalia impressa
Bolitobius cingulatus
Bolitochara oblique
Cis boleti
Cychramus luteus
Dacne bipustulata
Dacne rufifrons
Diaperis boleti
Eledona agricola
Enicmus rugosus
Ennearthron cornutum
Gryophaena lucidula
Hallomenus binotatus
Hapalarea pygmaea
Hister unicolor
Lordithon lunulatus
Lordithon trinotatus
Mycetophagus multipunctata
Mycetophagus piceus
Mycetophagus quadripustulatus
Omalium rivulare
Philonthus marginatus
Philonthus splendens
Proteinus brachypterus
Quedius cruentus
Quedius lateralis
Quedius mesomelinus
Sciodrepoides fumata
Triplax russica

Leaf litter and rotting vegetable material

A considerable number of species are associated with these media and, in addition to those listed below, some of the Carabidae associated with damp or moist conditions will be found amongst leaf litter etc., as mentioned earlier:

Acrotrichus intermedia
Aleochara sparsa
Aridius nodifer
Cortinicara gibbosa
Gyrohypnus angustatus
Hister impressus
Lithocharis ochracea
Mycetoporus rufescens
Nargus wilkini
Proteinus brachypterus
Quedius mesomelinus
Rugilus erichsoni
Sciodrepoides fumata
Sciodrepoides watsoni
Stephostethus lardarius
Tachinus humeralis
Tachinus pallipes
Tachinus subterraneus

Omalium rivulare
Onthophilus striatus
Platarea brunnea
Xantholinus linearis
Xantholinus longiventris

Moss

There are thirteen species which are often encountered amongst mosses:

Corticaria umbiculata
Mycetoporus rufescens
Olophrum piceum
Othius angustatus
Othius leaviusculus
Othius punctulatus
Philonthus marginatus
Philonthus splendens
Pterostichus strenuus
Rugilus erichsoni
Silpha atrata
Stenichnus scutellaris
Trixagus dermestoides

Dung

This group comprises six species usually associated with the dung of herbivores, including deer.

Aphodius fossor
Aphodius rufipes
Aphodius sphacelatus
Typhoeus typhaeus
Philonthus marginatus
Philonthus splendens

Bird Nests

The first investigation of the beetle fauna of bird nests in the wood was not carried out until 2005, when material from nest boxes used by Blue and Great Tits was examined. A limited number of species was found:

Aridius nodifer
Catops fuliginosus
Cerylon histeroides
Dendrophilus punctatus
Gnathoncus nennetensis
Lathridius lardarius
Sciodrepoides fumata

DISCUSSION AND SUMMARY

There can be little doubt that Swanton Novers Woods is arguably the most important and unusual area of woodland in Norfolk, and is of major significance in the wider context of East Anglia as a whole. Nearly 30 years ago Ratcliffe (1977) stated "*Swanton Novers is undoubtedly an important site, containing three woodland types, each of which on its own would have been enough to justify selection.*" (as a site of national importance to nature conservation). The wood straddles a geological boundary between glacial sands and gravels to the north and calcareous boulder clay at the southern end, and correlated with this is the boundary between two major contrasting types of woodland (see the section on woodland types above). The presence of a number of ponds is an important feature of this site which is the only place in Norfolk where all three native species of newt occur together. There are, as discussed above, many features of

the fauna and flora which confirm the site's ancient woodland and ancient wood-pasture origins.

It is the varied habitat-types that make the site so important. The work by Peterken (1970) identified three main woodland types, two of which could be further subdivided to give a total of six broad-leaved woodland communities, plus coniferous woodland (see Figure 2). With the later introduction of the stand-type system for classifying woodland tree communities (Peterken 1981), it became possible to recognise a total of eight stand-types and sub-divisions, plus conifers. These are all listed in Appendix 2 which also shows how they relate to the more recent National Vegetation Classification (NVC) system described by Rodwell (1991). The ground flora comprises a mixture of calcifuge and calcicole species, as described earlier in the section on Biodiversity.

Where waterlogged conditions prevail seepage or flush plant communities are found, including one in the extreme south of Great Wood which is quite uncommon in Norfolk today, except on a few remnant commons in the south of the county. Also important in the vascular flora are the ancient woodland indicator species, of which a total of 33 are recognised in Norfolk (see the section on Features of Interest). The flora of Swanton Novers Woods includes 22 (67%) of these species.

Studies of the lepidoptera have revealed the presence of 544 species of moths and 29 of butterflies. Some 18% of the former are local or Red Data Book species. The moth fauna includes several species of particular interest which reflect the diversity of habitats present. These include the Dotted Fan-foot which is a fen and marshland species which has its Norfolk stronghold in The Broads; the Oak Lutestring was found in Little Wood which appears to be its only known Norfolk site; and the Red-necked Footman found in 1996 which is probably the first twentieth century record for Norfolk.

The ponds and flooded wheel ruts are a feature lacking in most other woods. Together they provide a habitat for no less than 51 species of water beetle (10% of the total beetle fauna of the woods). Even more important, particularly in the ancient woodland and ancient wood-pasture context, are the 72 species of saproxylic beetles. The total beetle fauna of 501 species includes 34 local or Red Data Book species (as defined in Hyman & Parsons (1992 & 1994).

Given the uniqueness of Swanton Novers Woods it is difficult to make comparisons with other woods in Norfolk. The only real contender is Foxley Wood which is of similar size (excluding the coniferised section) of which Ratcliffe (1977) said: "*It is almost as important as Swanton Novers, and in many respects is similar and is graded as an alternative site.*"

Three broad woodland types occur in Foxley Wood, including a flushed tract with Alder. Much of the wood is on heavy clay, whereas Swanton Novers Wood is on lighter soils and is much more acid. The following table compares the fauna and flora of the two woods:

	Swanton Novers	**Foxley**
Vascular flora	327 [a]	323 [a]
AWVPs	21	23
Bryophytes	76	69
Lichens	35	25
Fungi	750	601
Butterflies	29	29
Moths	544	343
Dragonflies	17	[b]
Beetles	500	136 [c]

a Excludes microspecies of bramble.
b No records for this group have ever been submitted.
c This group has not been intensively studied in the wood.

In considering the data in the table it should be borne in mind that the recording effort at Swanton Novers Woods, with its succession of summer wardens and other recorders, has been much more intensive than is the case at Foxley Wood. It can be seen that both Foxley Wood and Swanton Novers Woods each have 23 (70%) of the Norfolk AWVPs. There are some differences in composition in that the following species have been recorded in Foxley Wood but not in Swanton Novers: Greater Butterfly Orchid *Platanthera chlorantha*, Goldilocks Buttercup *Ranunculus auricomus* and Thin-Spiked Wood Sedge *Carex strigosa.* Conversely, the following have been recorded in Swanton Novers but not in Foxley Wood: Nettle-leaved Bellflower *Campanula trachelium*, Lemon-scented Fern *Oreopteris limbosperma* and Great Wood-rush *Luzula sylvatica.*

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Appendix 1: DISTRIBUTION OF AQUATIC PLANTS IN PONDS AT SWANTON NOVERS WOODS

Plant	Comp. 4	North	South	Little Wood
Blunt-fruited Water Starwort *Callitriche obtusangula*	x			
Common Water Starwort *Callitriche stagnalis*		x	x	x
Marsh Marigold *Caltha palustris*	x			
Lesser Pond Sedge *Carex acutiformis*		x	x	x
Common Sedge *Carex nigra*				x
False Fox Sedge *Carex otrubae*	x		x	x
Greater Horsetail *Equisetum telmateia*				x
Floating Sweet-grass *Glyceria fluitans*				x
Water Violet *Hottonia palustris*	x			
Yellow Iris *Iris pseudacorus*	x			
Soft Rush *Juncus effusus*		x	x	x
Common Duckweed *Lemna minor*	x	x	x	x
Ivy-leaved Duckweed *Lemna trisulca*	x	x	x	x
Water Mint *Mentha aquatica*	x	x	x	x
Tufted Forget-me-not *Myosotis laxa*	x			
Broad-leaved Pondweed *Potamogeton natans*	x	x		
Common Water Crowfoot *Ranunculus aquatilis*	x			
Lesser Spearwort *Ranunculus flammula*	x			
Thread-leaved Water Crowfoot *Ranunculus trichophyllus*		x	x	
Greater Yellowcress *Rorippa amphibia*	x			
Water Soldier *Stratiotes aloides*			x	
Bulrush *Typha latifolia*		x		
Brooklime *Veronica beccabunga*	x	x	x	x
TOTAL	**14**	**10**	**10**	**11**

Appendix 2: WOODLAND TYPES IN SWANTON NOVERS GREAT AND LITTLE WOODS

Type (a)	Stand Types	Area ha. (c)	NVC Types (d)	Notes
A	6Dc	2-10	W10	This might include woodland with Sessile Oak in which case it would be Stand type 6Cc.
B	3A	<0.5	(W8), W10	Just possible that some fragments include Field Maple in which case they would be Stand Type 2A.
	4A	<0.5	W10	
	4Ba	2-10	W8, W10	
C	5A	0.5-2	W10, W16a	
	5B	>10	(W10), W16a	
D	7E	>10	W7	
E	6Cc	>10	W10a	Oak woodland of the slightly acid type, with Bracken dominant in the ground flora: on brown earth soils.
F	6Cb	2-10	W16b	Oak woodland of the acid type, with the moss *Leucobryum glaucum* dominating the ground flora.

(a) Type as mapped by G.F.Peterken.

(b) Stand types identified by Suzanne Goodfellow.

(c) Areas in hectares as measured by Suzanne Goodfellow.

(d) Probable equivalent types in the NVC.

Appendix 3: COLEOPTERA RECORDED IN GREAT AND LITTLE WOODS, SWANTON NOVERS, AUGUST 2005

ANOBIIDAE
Grynobius planus (Fab.) *
Ptilinus pectinicornis (L.) *

APIONIDAE
Apion (Protapion) apricans (Herbst.)
Apion (Protapion) assimile (Kirby)
Apion (Ceratapion) carduorum (Kirby)
Apion (Protapion) fulvipes (Geoff.)
Apion (Exapion) fuscirostre (Fab.)
Apion (Omphalapion) hookerorum (Kirby)
Apion (Perapion) hydrolapathi (Marsh.)
Apion (Pirapion) immune Kirby
Apion (Ischnopterapion) loti Kirby
Apion (Kalcapion) pallipes Kirby
Apion (Betulapion) simile (Kirby)
Apion (Ulapion) ulicis (Forster)
Apion (Chlorapion) virens (Herbst.)
Apion (Cnemapion) vorax (Herbst.)

ATELLABIDAE
Apoderus coryli (L.)
Attelabus nitens (Scop.)

BUPESTRIDAE
Agrilus laticornis (Illiger) * NOTABLE B*
Agrilus pannonicus (Pill. & Mitt.) *
NOTABLE A

BYRRHIDAE
Byrrhus pilula L.
Byrrhus pustulatus (Forst.)

BYTURIDAE
Byturus ochraceus (Scriba)
Byturus tomentosus (Degeer)

CANTHARIDAE
Cantharis cryptica Ashe
Cantharis decipiens Baudi
Cantharis livida L.
Cantharis nigra (Degeer)
Cantharis nigricans (Muller)
Cantharis pallida Goeze
Cantharis pellucida Fab.
Cantharis rustica Fallen
Malthinus flaveolus (Herbst.) *
Malthodes minimus (L.) *
Rhagonycha fulva (Scop.)
Rhagonycha lignosa (Mull.)
Rhagonycha limbata Thomson
= Rhagonycha femoralis (Brulle)

CARABIDAE
Abax parallelepipedus (Pill. & Mitt.)
Acupalpus consputus (Duft.) NOTABLE B
Agonum albipes (Fab.)
Agonum muelleri (Herbst.)
Amara aulica (Panzer)
Amara aenea (Degeer)
Amara lunicollis Schiodte
Amara ovata (Fab.)
Amara plebeja (Gyll.)
Amara similita (Gyll.)
Bembidion articulatum Panzer
Bembidion dentellum (Thunb.)
Bembidion doris (Panzer)
Bembidion lampros (Herbst.)
Bembidion mannerheimi Sahlberg
Bembidion obtusum Serville
Bembidion quadrimaculatum (L.)
Bembidion tetracolum Say
Bembidion varium (Oliv.)
Bradycellus harpalinus (Serville)
Calathus piceus (Marsh.)
Carabus nemoralis Muller
Carabus violaceus L.
Chlaenius vestitus (Paykull)
Cicindela campestris L.
Cychrus caraboides (L.)
Dromius linearis (Ol.)
Dromius melanocephalus Degeer
Dromius quadrimaculatus (L.)
Elaphrus cupreus Duft.
Elaphrus riparius (L.)
Harpalus latus (L.)
Leistus ferrugineus (L.)
Leistus fulvibarbis Dejean
Leistus rufescens (Fab.)
Leistus spinibarbis (Fab.)
Loricera pilicornis (Fab.)
Nebria brevicollis (Fab.)

Notiophilus biguttatus (Fab.)
Notiophilus palustris (Duft.)
Notiophilus rufipes (Strom.)
Patrobus atrorufus (Strom.)
Pterostichus cupreus (L.)
Pterostichus madidus (Fab.)
Pterostichus melanarius (Ill.)
Pterostichus niger (Schaller)
Pterostichus nigrita agg.
Pterostichus nigrita s.s. (Paykull)
Pterostichus strenuus (Panz.)
Pterostichus versicolor(Sturm.)
Stenolophus mixtus (Herbst.)
Trechus quadristriatus (Schrank.)

CERAMBYCIDAE
Agapanthia villosoviridescens (Degeer)
*Alosterna tabacicolor (Degeer) **
*Arhopalus rusticus (L.) **
*Clytus arietis (L.) **
*Grammoptera ruficornis (Fab.) **
*Leiopus nebulosus (L.) **
Stictoleptura rubra (L.) = Leptura rubra L
*Phymatodes testaceus (L.) **
*Poecilium alni(L.) * NOTABLE A*
Pseudoradonia livida (Fab.)
= Leptura livida Fab.
*Rhagium bifasciatum Fab.**
*Rhagium mordax (Degeer) **
*Rutpela maculata (Poda.) **
*Stenocorus meridianus (L.) **
*Stenurella melanura (L.) **
= Strangalia melanura (L.)
*Tetrops praeusta (L.) **

CERYLONIDAE
*Cerylon ferrugineum Stephens **
*Cerylon histeroides (Fab.) **

CHRYSOMELIDAE Bruchinae
Bruchidius villosus (Fab.)
Bruchus loti (Paykull)
Bruchus rufimanus Boheman

CHRYSOMELIDAE other subfamilies
Altica palustris Weise
Aphthona euphorbiae (Schrank.)
Aphthona nonstriata (Goeze)
Cassida rubiginosa Muller
Cassida vibex L.
Cassida viridis L.
Chaetocnema hortensis (Fourcroy)
Chrysolina polita (L.)
Chrysolina staphylea (L.)
Crepidodera aurata (Marsh.)
= Chalcoides aurata (Marsh.)
Crepidodera aurea (Fourcroy)
= Chalcoides aurea (Fourcroy)
Crepidodera fulvicornis (Fab.)
= Chalcoides fulvicornis (Fab.)
Crioceris asparagi (L.)
Cryptocephalus pusillus Fab.
Donacia semicuprea Panzer
Donacia simplex (Fab.)
Epitrix pubescens (Koch.)
Galerucella calmariensis (L.)
Galerucella lineola (Fab.)
Galerucella nymphaeae (L.)
Galerucella tenella (L.)
Lochmaea capreae (L.)
Lochmaea suturalis (Thomson)
Longitarsus jacobaeae (Waterhouse)
Longitarsus parvulus (Paykull) NOTABLE A
Longitarsus succineus (Foudras)
Luperus longicornis (Fab.)
Neocrepidodera transversa (Marsh.)
= Crepidodera transversa (Marsh.)
Oulema melanopa (L.) s.s.
Phaedon armoraciae (L.)
Phratora vulgatissima (L.)
= Phyllodecta vulgatissima (L.)
Phyllotreta atrata (Fab.)
Phyllotreta tetrastigma (Comolli)
Prasocuris junci (Brahm.)
Psylliodes affinis (Payk.)
Psylliodes dulcamarae (Koch)
Sphaeroderma rubidum (Graells)

CIIDAE
Cis bilamellatus Wood
*Cis boleti (Scopoli) **
*Ennearthron cornutum (Gyll.) **

COCCINELLIDAE
Adalia 2-punctata (L.)
Adalia 10-punctata (L.)
Anatis ocellata (L.)
Aphidecta obliterata (L.)

Calvia l4-guttata (L.)
Chilocorus renipustulatus (Scriba)
Coccinella 7-punctata (L.)
Exochomus quadripustulatus (L.)
Halyzia 16-guttata (L.)
Harmonia 4-punctata (Pont.)
Hippodamia variegata (Goeze)
= Adonia variegata (Goeze) NOTABLE B
Myrrha 18-guttata L.
Propylea l4-punctata (L.)
Psyllobora 22-punctata (L.)
= Thea 22-punctata (L.)
Rhyzobius litura (Fab.)
Subcoccinella 24-punctata (L.)
Tytthaspis l6-punctata (L.)

COLYDIIDAE
*Bitoma crenata (Fab.) **

CRYPTOPHAGIDAE
Atomaria nigirostris Stephens
*Cryptophagus micaceus Rey * RDBK*
Cryptophagus pilosus Gyll.
*Henoticus serratus (Gyll.) **
Micrambe vini (Panzer)

CURCULIONIDAE Scolytinae
*Ernoporus caucasicus Lindemann * RDB1*
*Hylesinus crenatus (Fab.) **
*Leperisinus varius (Fab.) **
*Scolytus intricatus (Ratzeberg) **

CURCULIONIDAE other subfamilies
Anoplus plantaris (Naezen)
Anthonomus bituberculatus Thomson
Archarius pyrrochoceros Marsh.
= Curculio pyrrochoceros
Archarius salicivorus Payk.
= Curculio salicivorus
Barynotus moerens (Fab.)
Barypeithes araneaformis (Schrank)
Ceutorhynchus constrictus (Marsh.)
NOTABLE B
Ceutorhynchus minutus (Reich.)
= C. contractus
Ceutorhynchus obstrictus (Marsh.) (Marsh.)
= C .assimilis sensu auct.
Ceutorhynchus pallidactylus (Marsh.)
Cionus scrophulariae (L.)
Coeliodes rana (Fab.)
= C.dryados (Gmelin)
Coeliodinus rubicundus Herbst.
Curculio nucum L.
Curculio venosus (Grav.)
Dorytomus dejeani Faust.
Dorytomus salicinus (Gyll.) NOTABLE B
Dorytomus taeniatus (Fab.)
Drupenatus nasturtii (Germar)
*Hylobius (Callirus) abietis (L.) **
Hypera postica (Gyll.)
Hypera (Erirnomorphus) rumicis (L.)
= Cidnorhinus quadrimaculatus (L.)
Hypera (Antiodonus) zoilus (Scopoli)
= H.punctata (Fab.)
Leisoma deflexum (Panz.)
Liophloeus tessulatus (Muller)
Magdalis (Odontomagdalis) carbonaria (L.)
NOTABLE B
Mecinus pascuorum (Gyll.)
= Gymnetron pascuorum
Micrelus ericae (Gyll.)
Microplontus rugulosus (Herbst.)
Mogulones asperifoliarum (Gyll.)
Nedyus quadrimaculatus (L.)
Neliocarus nebulosus (Stephens)
Orchestes quercus (L.)
= Rhynchaenus quercus
Orchestes rusci (Herbst.)
= Rhynchaenus rusci
Otiorhynchus (Dorymerus) singularis (L.)
Otiorhynchus (Dorymerus) sulcatus (Fab.)
Parethelcus (Ceutorhynchus) pollinarius (Forst.)
Phyllobius (Dieletus) argentatus (L.)
Phyllobius (Metaphyllobius) glaucus (Scop.)
Phyllobius (Nemoicus) oblongus (L.)
Phyllobius (Metaphyllobius) pomaceus Gyll.
Phyllobius pyri (L.)
Phyllobius (Parnemoicus) viridcollis (Fab.)
Polydrusus (Neoeustolus) cervinus (L.)
Polydrusus (Eurodrusus) confluens Stephens
NOTABLE B
Polydrusus (Eustolus) pterygomalis Boheman
Polydrusus tereticollis (Degeer)
Ramphus pulicarius (Herbst.)
Rhinoncus pericarpius (L.)

Sciaphilus asperatus (Bonsdorff)
Sitona cylindricollis (Fahraeus)
Sitona humeralis Stephens
Sitona lepidus Gyll.
Sitona lineatus (L.)
Sitona regensteinensis (Herbst.)
Sitona suturalis Stephens
Strophosoma capitatum (Degeer)
Strophosoma melanogrammum (Forster)
Tachyerges salicis(L.)
= Rhynchaenus salicis (L.)
Trichosirocalus troglodytes (Fab.)
Tychius picirostris (Fab.)
= Miccotrogus picirostris (Fab.)

DYTISCIDAE
Acilius sulcatus (L.)
Agabus bipustulatus (L.)
Agabus didymus (Olivier)
Agabus guttatus (Paykull)
Agabus nebulosus (Forster)
Agabus sturmi (Gyll.)
Colymbetes fuscus (L.)
Dytiscus marginalis L.
Hydroporus angustatus Sturm
Hydroporus erythrocephalus (L.)
Hydroporus gyllenhalii Schiodte
Hydroporus incognitus Sharp
Hydroporus melanarius Sturm
Hydroporus memnonius Nicolai
Hydroporus neglectus Schaum NOTABLE B
Hydroporus nigrita (Fab.)
Hydroporus palustris (L.)
Hydroporus planus (Fab.)
Hydroporus pubescens (Gyll.)
Hydroporus striola (Gyll.)
Hydroporus tessellatus Drapiez
Hygrotus impressopunctatus (Schaller)
Hygrotus inaequalis (Fab.)
Hyphydrus ovatus (L.)
Ilybius ater (Degeer)
Ilybius chalconotus (Panz.) NOTABLE B
Ilybius fuliginosus (Fab.)
Ilybius montanus (Stephens)
Laccophilus minutus (L.)
Rhantus suturalis (Macleay) NOTABLE B
Suphrodytes dorsalis (Fab.)

ELATERIDAE
Agriotes acuminatus (Steph.)
Agriotes lineatus (L.)
Agriotes pallidulus (Illiger)
Agriotes sputator (L.)
*Ampedus quercicola (du Bysson) * NOTABLE B*
Aplotarsus incanus (Gyll.)
= Selatosomus incanus (Gyll.)
Athous haemorrhoidalis (Fab.)
Athous vittatus (Fab.)
Dalopius marginatus (L.)
*Denticollis linearis (L.) **
Hemicripidius hirtus (Herbst.)
Kibunea minuta (L.)
*Melanotus villosus (Geoff.) **
*Stenagostus rhombeus (Oliv.) **

ELMIDAE
Elmis aenea (Muller)

EROTYLIDAE
*Dacne bipustulata (Thunberg) **
*Dacne rufifrons (Fab.) **
*Triplax russica (L.) **

EUCNEMIDAE
*Melasis bupestoides (L.) * NOTABLE B*

GEOTRUPIDAE
Typhaeus typhoeus (L.)

GYRINIDAE
Gyrinus substriatus Stephens

HALIPLIDAE
Haliplus confinis Stephens
Haliplus lineatocollis (Marsh.)
Haliplus ruficollis (Degeer)

HELOPHORIDAE
Helophorus brevipalpis Bedel
Helophorus minutus Fab.
Helophorus obscurus Mulsant

HISTERIDAE
Baeckmanniolus dimidiatus (Ill.) NOTABLE B
Dendrophilus punctatus (Hbst.)
Gnathoncus nannetensis (Morseul)
Hister impressus Fab.

Hister unicolor L
Onthophilus striatus (Forster)

HYDRAENIDAE
Octhebius minimus (Fab.)
Hydraena testacea Curtis NOTABLE B

HYDROPHILIDAE
Anacaena bipustulata (Marsh.) NOTABLE B
Anacaena globulus (Payk.)
Anacaena lutescens (Stephens)
Cercyon lateralis (Marsh.)
Cercyon sternalis Sharp NOTABLE B
Helochares lividus (Forster) NOTABLE B
Hydrobius fuscipes (L.)
Laccobius bipunctatus (Fab.)
Laccobius colon (Stephens)
= Laccobius biguttatus Gerhardt.
Laccobius minutus (L.)
Laccobius striatulus (Fab.)
Megasternum obscurum (Marsh.)
Sphaeridium lunatum Fab.

HYGROBIIDAE
Hygrobia herrmanni (Fab.)

LAMPYRIDAE
Lampyrus noctiluca (L.)

LATHRIDIIDAE
Aridius nodifer (Westwood)
Corticaria umbicilata (Beck)
Cortinicara gibbosa (Herbst.)
*Enicmus rugosus (Herbst.) * NOTABLE B*
Stephostethus lardarius (Degeer)

LEIODIIDAE
Amphicyllis globus (Fab.)
*Anisotoma humeralis (Fab.) **
Catops fuliginosus Erichson
Catops grandicollis Erichson
Catops nigrita Erichson
Colenis immunda (Sturm.)
Nargus wilkini (Spence)
Sciodrepoides fumata (Spence)
Sciodrepoides watsoni (Spence)

LUCANIDAE
*Dorcus parallelipipedus (L.) **
*Sinodendron cylindricum (L.) **

LYCIDAE
*Platycis minuta (Fab.) * NOTABLE B*

MELANDRYIDAE
*Conopalpus testaceus (Ol.) * NOTABLE B*
*Hallomenus binotatus(Quensel) **
*Melandrya caraboides (L.) * NOTABLE B*

MELYRIDAE
*Dasytes aeratus Stephens **
*Malachius bipustulatus (L.) **

MYCETOPHAGIDAE
*Mycetophagus multipunctatus Fab.**
*Mycetophagus piceus (Fab.) * NOTABLE B*
*Mycetophagus quadripustulatus (L.) **

NITIDULIDAE
Brachypterus urticae (Fab.)
Cychramus luteus (Fab.)
Glischrochilus hortensis (Fourcroy)
Epuraea aestiva (L.)
Epuraea melanocephala (Marsh.)
*Epuraea marseuli Reitter **
Epuraea unicolor (Ol.)
Kateretes rufilabris (Latr.)
Meligethes aeneus (Fab.)
Meligethes atratus (Ol.)
Meligethes brunnicornis Sturm.
Meligethes carinulatus Forster
Meligethes nigrescens Stephens
Meligethes ruficornis (Marsh.)
*Soronia punctatissimus (Ill.) **

OEDEMERIDAE
Oedemera lurida (Marsh.)

PHALACRIDAE
Olibrus corticalis (Panz.)
Stilbus testaceus (Panz.)

PTILIDAE
Acrotrichis intermedia (Gillmeister)

RHIZOPHAGIDAE
*Rhizophagus bipustulatus (Fab.) **
*Rhizophagus dispar (Payk.) **

RHYNCHITIDAE
Caenorhinus mannerheimi (Hummel)
= Deporaus mannerheimi

Deporaus betulae (L.)
Neoceonorrhinus aeneovirens (Marsh.)
= Rhynchites aeneovirens
Neoceonorrhinus aequatus (L.)
= Rhynchites aequatus
Neoceonorrhinus germanicus Herbst.
= Rhynchites germanicus
Temnocerus longiceps Thomson
= Rhynchites longiceps NOTABLE B
Temnocerus nanus (Payk.)
= Rhynchites nanus

SALPINGIDAE
*Rhinosimus planirostris (Fab.) **

SCAPHIDIIDAE
*Scaphidium quadrimaculatum Ol .**

SCARABAEIDAE
Amphimallon solstitale Muller
Aphodius fossor (L.)
Aphodius rufipes (L.)
Aphodius sphacelatus (Panzer)
Melolontha melolontha (L.)
Serica brunnea (L.)

SCIRTIDAE
Cyphon coarctatus Payk.
Cyphon ochraceus Stephens
Cyphon padi (L.)
Cyphon variabilis (Thunberg)
Elodes minuta (L.)
Microcara testacea (L.)

SCRAPTIIDAE
*Anaspis frontalis (L.) **
*Anaspis humeralis (Fab.) **
*Anaspis lurida Stephens **
Anaspis maculata Fourcroy
*Anaspis pulicaria Costa, A. **
Anaspis regimbarti Schilsky
*Anaspis rufilabris (Gyll.) **

SCYDMAENIDAE
Stenichnus scutellaris (Muller & Kunze)

SILPHIDAE
Dendroxena quadrimaculata (Scopoli)
NOTABLE B
Necrodes littoralis (L.) NOTABLE B
Nicrophorus humator (Gleditsch)
Nicrophorus investigator Zett.
Nicrophorus vespillo (L.)
Nicrophorus vespilloides Herbst.
Oiceoptoma thoracicum (L.)
Silpha atrata L.
Thanatophilus rugosus (L.)

SPHINDIDAE
*Aspidophorus orbiculatus (Gyll.) **

STAPHYLINIDAE Pselaphinae
Bryaxis bulbifer (Reichenbach)

STAPHYLINIDAE other subfamilies
Aleochara sparsa Heer
Anotylus inustus (Grav.)
Anotylus rugosus (Fab.)
Anotylus sculpturatus (Grav.)
Anthobium atrocephalum (Gyll.)
Atheta castanoptera (Mannerheim)
Atheta triangulum (Kraatz)
Autalia impressa (Ol.)
Bisnius sordidus (Grav.)
= Philonthus sordidus (Grav.)
Bolitobius cingulatus (Marm.)
Bolitochara obliqua Erichson
*Coryphium angusticolle Stephens **
Creophilus maxillosus (L.)
Eusthalerum luteum (Marsh.)
*Gabrius splendidulus (Grav.) **
*Gyrophaena lucidula Erichson **
NATIONALLY NOTABLE
Gyropypnus angustatus (Stephens)
*Hapalarea pygmaea (Payk.) **
Lathrobium brunnipes (Fab.)
Lathrobium fulvipenne (Grav.)
Liogluta longiuscula (Grav.)
Lithocharis ochracea (Grav.)
Lordithon lunulatus (L.)
Metopsia clypeata (Muller)
= Metopsia retusa (Stephens)
Microdota amicula (Stephens)
Mycetoporus lepidus (Grav.)
Ocypus (Pseudocypus) aeneocephalus (Degeer)
Ocypus (Matidus) brunnipes (Fab.)
Ocypus olens (Muller, O.F.)
Oligota inflata (Mannerheim)
Oligota parva Kraatz

Oligota pumilio Kieserwetter
Oligota punctulata Heer
Olophrum piceum (Gyll.)
Omalium rivulare (Payk.)
Ontholestes murinus (L.)
Othius angustus Stephens
Othius laeviusculus Stephens
Othius punctulatus (Stephens)
Philonthus addendus Sharp
Philonthus cognatus Stephens
Philonthus decorus (Grav.)
Philonthus marginatus (Strom.)
Philonthus politus (L.)
Philonthus quisquilarius (Gyll.)
Philonthus splendens (Fab.)
Philonthus succicola Thomson
Philonthus tenuicornis Muls. & Rey
Philonthus umbratilis (Grav.)
Philonthus varius (Gyll.)
Philorinum sordidum (Steph.)
Platarea brunnea (Fab.)
Platydracus stercorarius (Ol.)
Proteinus brachypterus (Fab.)
Quedius cruentus (Ol.)
Quedius curtipennis Bernh.
Quedius fuliginosus (Grav.)
Quedius (Microsaurus) lateralis (Grav.)
Quedius (Raphurus) maurorufus (Grav.)
*Quedius (Microsaurus) maurus (Sahlberg) **
Quedius (Microsaurus) mesomelinus (Marsh.)
*Quedius (Microsaurus) scitus (Grav.) * NOTABLE B*
Rugilus erichsoni (Fauvel)
Stenus bimaculatus Gyll.
Stenus (Tesnus) brunnipes Stephens
Stenus (Hypostenus) cicindeloides (Schaller)
Stenus clavicornis (Scop.)
Stenus (Metastenus) flavipes Stephens
Stenus (Hemistenus) impressus Germar
Stenus (Metastenus) nitidiusculus Stephens
Stenus (Metastenus) pallitarsis Stephens
Stenus (Metastenus) picipennis Erichson
Stenus (Metastenus) picipes Stephens
Stenus similis (Herbst.)
Stenus (Hypostenus) tarsalis Ljungh
Tachinus humeralis Grav.
Tachinus pallipes (Grav.)
Tachinus proximus Kraatz
Tachinus signatus Grav.
Tachinus subterraneus (L.)
Tachyporus hypnorum (Fab.)
Tachyporus obtusus (L.)
Tachyporus pallidus Sharp
Tachyporus solutus Erichson
Tasgius morsitans (Rossi)
= Ocypus compressus Marsh.
Xantholinus linearis (Ol.)
Xantholinus longiventris Heer

TENEBRIONIDAE
*Diaperis boleti (L.) * RDB2*
*Eledona agricola (Herbst.) * NOTABLE B*
Isomira murina (L.)
Lagria hirta (L.)
*Prionychus ater (Fab.) * NOTABLE B*
Tenebrio molitor (Fab.)

THROSCIDAE
Trixagus dermestoides (L.)

Total species: 500
* Qualifying saproxylic species (72, excluding 2 conifer-related species).

Reed-choked pond, Manor Common, Hapton, 2005. *Photo*: Alec Bull.

Hemp-agrimony *Eupatorium cannabinum* at Manor Common, Hapton. *Photo*: Alec Bull.

Common Fleabane *Pulicaria dysenterica* at Manor Common, Hapton. *Photo*: Alec Bull.

South Pond, Swanton Novers Great Wood, March 2005.
Photo: Bryan Sage.

Compartment 4 Pond, Swanton Novers Great Wood, May 2005.
Photo: Bryan Sage

Upper Pond, Swanton Novers Little Wood, May 1999.
Photo: Bryan Sage.

Appendix 4: WATER BEETLES AT GREAT AND LITTLE WOODS, SWANTON NOVERS

	North Pond	South Pond	Comp. 4 Pond	Flooded Ruts	Little Wood
DYTISCIDAE					
Acilius sulcatus	x	x	x		x
Agabus bipustulatus	x	x	x	x	x
Agabus guttatus					x
Agabus nebulosus	x				
Agabus sturmi	x		x		
Colymbetes fuscus	x	x	x		x
Dytiscus marginalis		x			x
Hydroporus angustatus		x			
Hydroporus erythrocephalus	x	x	x		x
Hydroporus gyllenhalii				x	x
Hydroporus incognitus				x	
Hydroporus melanarius				x	
Hydroporus memnonius	x	x	x	x	
Hydroporus neglectus				x	
Hydroporus nigrita				x*	
Hydroporus palustris	x	x	x		x
Hydroporus planus	x	x	x	x	
Hydroporus pubescens				x	
Hydroporus striola	x				x
Hydroporus tessellatus		x		x	
Hygrotus inaequalis	x	x	x		x
Hyphydrus ovatus	x	x	x		x
Ilybius ater				x	
Ilybius chalconotus			x	x	
Ilybius fuliginosus	x	x	x		x
Ilybius montanus				x	
Lacophilus minutus	x		x		
Rhantus suturalis	x				
Suphrodytes dorsalis	x	x	x		
....continued					

* This species has also been recorded in the small pond adjacent to Ride 32 in Little Wood (see text).

	North Pond	South Pond	Comp. 4 Pond	Flooded Ruts	Little Wood
GYRINIDAE					
Gyrinus substriatus	x	x	x		x
HALIPLIDAE					
Haliplus confinis		x			
Haliplus lineatocollis			x		x
Haliplus ruficollis	x	x	x		x
HELEPHORIDAE					
Helophorus brevipalpis					x
Helophorus minutus	x	x			
Helophorus obscurus					x
HYDRAENIDAE					
Octhebius minimus					x
HYDROPHILIDAE					
Anacaena bipustulata		x			
Anacaena lutescens	x				
Helochares lividus		x			
Hydrobius fuscipes	x	x		x	x
Laccobius bipunctatus		x			
Laccobius colon		x			
Laccobius minutus	x		x		
Laccobius striatulus	x				
HYGROBIDAE					
Hygrobia hermanni			x		
TOTAL 46	**23**	**23**	**20**	**13**	**20**

Appendix 5: SWANTON NOVERS WOODS: QUALIFYING SAPROXYLIC SPECIES

Species	Score	Year	Ecology
ANOBIIDAE			
Grynobius planus (Fab)	2	2000	Develops in dead timber of various broad-leaved trees
Ptilinus pectinicornis (L.)	1	1998	Bores in exposed dry heartwood of old broad-leaved trees
BUPESTRIDAE			
Agrilus laticornis (Illiger)	8	2001	Larvae in dying branches of oak
Agrilus pannonicus (Pill. & Mitter.)	8	2004	Larvae tunnel in and under thick oak bark, mainly old dying and dead trees
CANTHARIDAE			
Malthinus flaveolus (Herbst.)	1	1988	Widespread in broad-leaved woodland and hedgerows
Malthodes minimus (L.)	1	2001	Common and widespread in the south and east
CERAMBYCIDAE			
Alosterna tabacicolor (Degeer)	2	2000	Larva in old damp rotten stumps of hazel, hornbeam, maple and pine
Arhopalus rusticus (L.)		2002	
Clytus arietis (L.)	1	1999	Develops in a variety of dead broad-leaved trees
Grammoptera ruficornis (Fab.)	1	2000	Larvae in dead twigs and decaying small branches of many broad-leaved trees
Leiopus nebulosus (L.)	4	2001	Larvae bore beneath bark of dead lower branches of oak, and other trees
Leptura melanura (L.)	2	1997	Larvae in thin, decayed oak branches and in broom roots
Phymatodes testaceus (L.)	4	2004	Develops in dead branches, dead boles and logs of various broad-leaved trees
Poecilium alni (L.)	16	2005	In recently dead or decaying twigs and slender branches of various broad-leaved trees
Rhagium bifasciatum Fab.	1	2000	Develops in rotten boughs, stumps and trunks

Rhagium mordax (Degreer)	1	1995	Larvae develop in decaying timber, preferring the cambium and outer sapwood of rotting boles or stumps; most often found in oak, but also in other trees
Rutpela maculata (Poda)	1	2001	Develops in moist rotting wood of stumps and roots of broad-leaved trees and pine, but particularly birch
Stenocorus meridianus (L)	2	2004	Develops in stumps and dead roots of a wide range of trees
Tetrops praeusta (L.)	2	2000	Probably develops in dead branches
CERYLONIDAE			
Cerylon ferrugineum Stephens	2	2004	Develops beneath bark on dead broad-leaved timber in the early stages of decay; feed on fungal hyphae and spores
Cerylon histeroides (Fab.)	4	2004	In fungoid and decaying timber of various broadleaves, and pine
CIIDAE			
Cis boleti (Scopoli)	1	2004	Develops in the fully expanded fruit bodies of the fungus *Trametes versicolor*
Ennearthron cornutum (Gyll.)	2	2005	Larvae develop in the fruiting bodies of various bracket fungi
COLYDIIDAE			
Bitoma crenata (Fab.)	4	2004	Mainly beneath bark on dead beech and oak when in the early stages of decay and still sappy; also less frequently on birch.
CRYPTOPHAGIDAE			
Cryptophagus micaceus Rey	16	2002	In tree hole nests of hornet and social wasps; also reported from rotting timber, sap, fungi and nest debris
Henoticus serratus (Gyll.)	2	1999	Under bark on deadwood or at blossom, near fresh water
CURCULIONIDAE			
Ernoporus caucasicus Lindemann	16	1997	In bark of dead branches of both species of lime, perhaps only in sites where Small-leaved Lime has been present historically
Hylesinus crenatus (Fab.)	2	2003	Chiefly in dying ash, but also in oak, in rather thick bark of trunk
Hylobius abietis (L.)		1997	

Leperisinus varius (Fab.)	1	1997	In ash; in standing and fallen recently dead trunks and boughs
Magdalis carbonaria (L.)	4	1998	Associated with dead birch
Scolytus intricatus (Ratzeburg)	4	1999	Develops under bark of sickly or freshly dead oak boughs and branches, and also in other broadleaves.
ELATERIDAE			
Ampedus quercicola (du Bysson)	8	2004	Develops in decayed heartwood of birch, beech, hawthorn and probably other trees
Melanotus villosus (Geoff.)	1	2001	Larvae most frequently develop in red-rotted timber, but also in decaying wood
			generally
Stenagostus rhombeus (Oliv.)	4	2002	Larvae develop under loose bark of deadwood of various broad-leaved trees, and sometimes in the relatively soft heartwood beneath
EROTYLIDAE			
Dacne bipustulata (Thunberg)	2	2005	Adults in fruiting brackets of the softer polypore fungi on trunks of broad-leaved trees
Dacne rufifrons (Fab.)	2	2005	As for the preceding species
Triplax russica (L.)	4	1993	Develops in fungal fruiting bodies on various broad-leaved trees
EUCNEMIDAE			
Melasis bupestroides (L.)	4	1998	Develops in rather hard dead timber, especially boughs, of a wide variety of broad-leaved trees, standing and fallen timber
LATHRIDIIDAE			
Enicmus rugosus (Hbst.)	8	2005	In slime mould on trees, often under bark of dead wood, mainly oak
LEIODIIDAE Anisotoma humeralis (Fab.)	2	1998	Develops in slime fungi under bark on the trunks or fallen boughs of dead trees, adults found in ripe powdery stage, also in bracket fungi.
LUCANIDAE			
Dorcus parallelipipedus (L.)	2	1995	Larvae develop in heartwood of various broad-leaved trees where it is being decayed by a white-rot fungus.

Sinondendron cylindricum (L.)	2	2004	Bores in dead heartwood of large broad-leaved trees, and also pine, including stumps
LYCIDAE			
Platycis minuta (Fab.)	8	2004	Larvae develop in large relatively soft moist decaying heartwood, especially beech and probably ash
MELANDRYIDAE			
Conopalpus testaceus (Ol.)	8	1998	Develops in decaying boughs and branches, especially oak, also of hazel
Hallomenus binotatus (Quensel)	8	2005	Develops in the fruiting bodies of large bracket fungi
Melandrya caraboides (L.)	4	2000	Develops in relatively soft moist white-rotted heartwood of boughs, trunks and stumps; various broad-leaved trees, especially ash and beech.
MELYRIDAE			
Dasytes aeratus Stephens	2	2000	Adults usually found at blossom, especially on hawthorn. The larvae are carnivorous, over and under bark on live trunks as well as deadwood
Malachius bipustulatus (L.)	1	2001	Larvae partly predatory in holes of wood-borers.
MYCETOPHAGIDAE			
Mycetophagus multipunctatus Fab.	2	2005	In fungi on broad-leaved trees
Mycetophagus piceus (Fab.)	3	2005	Adults feed on fruiting bodies of bracket fungi
Mycetophagus quadripustulatus (L.)	2	1995	Adults found beneath fungoid bark and at soft bracket fungi, on a wide range of broad-leaved trees; develops most frequently in the fruiting brackets of *Polyporus squamosus*
NITIDULIDAE			
Epuraea morsueli Reitter	1	1995	At flowers, under sappy bark of deadwood and in tree fungi
Soronia punctatissima (Ill.)	2	1995	Associated with oak and alder; attracted to sappy stumps, as well as trees attacked by goat moth and clearwing moths.

RHIZOPHAGIDAE			
Rhizophagus bipustulatus (Fab.)	1	1997	Adults and larvae under bark of most dead broad-leaved trees;feed on fungal hyphae
Rhizophagus dispar (Payk.)	1	1998	Under bark of most dead broad-leaved trees, and in bracket fungi
SALPINGIDAE			
Rhinosimus planirostris (Fab.)	1	1997	Under bark on various broad-leaved trees in early stages of decay; normally saprophagous
SCAPHIDIIDAE			
Scaphidium quadrimaculatum Ol.	2	1997	Fungivorous in rotting timber
SCRAPTIIDAE			
Anaspis frontalis (L.)	1	1988	
Anaspis humeralis (Fab.)	2	1988	Larvae probably develop in dead branchwood of oak
Anaspis lurida Stephens	2	1995	As for the preceding species
Anaspis pulicaria Costa, A.	1	1988	
Anaspis rufilabris (Gyll.)	1	2002	Larvae probably develop in larger dead branchwood of oak
SPHINDIDAE			
Aspidiphorus orbiculatus (Gyll.)	2	2000	
STAPHYLINIDAE			
Coryphium angusticolle Stephens	2	1995	Under bark and in red-rotten oak
Gabrius splendidulus (Grav.)	1	2002	Under bark, especially of beech
Gryophaena lucidula Erichson	8	2001	In fungi on trees, including *Lentinus tigrinus* and *Gymnophilus junonius* on ash stumps in wet woodlands.
Hapalarea pygmaea (Payk.)	2	1988	Found in bracket fungi, bird nests and squirrel drays in tree canopy, rotten wood etc
Quedius maurus (Sahlberg)	4	1997	Rather strictly subcortical, and in moist crumbly rotten wood
Quedius scitus (Grav.)	8	1999	Usually subcortical, in moist crumbly red-rot of various broad-leaved trees

TENEBRIONIDAE			
Diaperis boleti (L.)	24	2004	Develops deep inside large brackets of *Piptoporus betulinus* on birch
Eledona agricola (Herbst.)	4	1981	Develops primarily in the fruiting bodies of *Laetiporus sulphureus*
Prionychus ater (Fab.)	8	1988	Larvae most often develop in black wood mould in hollowing broad-leaved trees
TOTAL 72 Plus two species (in italics) associated with conifers. **Saproxylic Quality Index = 271/72 x 100 = 376.4**	**271**		

Observations on the feeding habits of robberflies

P. J. Heath

3 Lock Cottages, Lock Road, Honing, North Walsham, Norfolk NR28 9PJ

During a visit to Holkham Meals on 29th June 2003, two species of robberfly were commonly encountered along the hoggin track running west from Lady Anne's Drive on the inland side of the pines. The Dune Robberfly *Philonicus albiceps* was characteristically seen sitting waiting for prey on the bare ground of the track itself. The Common Awl Robberfly *Neoitamus cyanurus* was usually found sitting on the foliage of the bushes beside the track, but was also noted utilising the handrails of the access ramps to the Washington Hide. Most of the prey records for this species are of small slow-flying moths (Stubbs & Drake, 2001), and this was borne out when on a capture dash from the handrail one of the Common Awl Robberflies caught a Single–dotted Wave *Idaea dimidiata*.

STUBBS, A. E. & DRAKE, M. 2001. *British Soldierflies and Their Allies*. British Entomological & Natural History Society, Reading.

Hapton Manor Common, South Norfolk

Research Committee project

Roy Baker (ed.)

126, Pelican Way, Norwich Road, Tacolneston, Norfolk NR16 1AL

Sections contributed by specific members are acknowledged at the end of that section.

Hapton Manor Common (TM168965) covers an area of 4.25ha. It consists of two fens separated by a small tributary stream of the River Tas known as the Bayes Stream, which rises in and around Tacolneston Hall approximately 3km to the west. The Bayes Stream is currently dug to a depth of 2m+ below the surrounding fens. The Upper Fen has ditches on the east and west sides with running water from springs and seepage. This raised fen falls from 30m OD to the stream at 25m OD and is fed from the springs which feed directly into the ditches which cause the wetter areas to dry out. There is a pond fairly high up on the site which was excavated in the late 1990s. "Mosses were just starting to colonise the dredged mud in March 2000" (P. Negal, *pers. com.*). The Upper Fen supports a mixed fen flora and is late summer/autumn grazed. The Lower Fen is in the Bayes Stream valley and is wetter, better parts supporting an excellent colony of Tussock Sedge *Carex paniculata*, whilst the remainder is derelict Heed *Phragmites australis* swamp, bounded by a tangle of hops *Humulus lupulus* and brambles *Rubus* sp. and penetrated by deer tracks.

At the eastern end of the Lower Fen is a stand of Alder *Alnus glutinosa* carr which supports a colony of Opposite-leaved Golden Saxifrage *Chrysosplenium oppositifolium*.

Janet Negal describes the Common at the end of the last war in 1945. "The common was at its best in spring and early summer. Snipe drummed overhead and undoubtedly nested, as did Lapwing. From early spring, their evocative calls as they tumbled in display flight were a feature of the common and later, when they had nests and eggs followed by hatched chicks, the parent birds would get up and run along dragging one wing and pretending to be injured to lead intruders away. With so many successful ground birds, it is inconceivable that there were any foxes. Today the nesting birds have gone and the characteristic smell of foxes is everywhere. There were otters in the stream. One was killed by the road and I can remember seeing its skin nailed up on a barn door to dry at grandfather's nearby farm. Lapwing used to nest where the pond was excavated a few years ago. At that time, the common was very green in spring, with clumps of rushes

and lots of flowers, including orchids. Wetter areas supported Bogbean *Menyanthes trifoliata* and the drainage ditch that ran down the middle to the stream was filled in spring with golden Kingcups *Caltha palustris*. There were also Wood Anemones *Anemone nemorosa* under the trees at the bottom of the common".

What a different picture the common presents today! It seemed a reasonably open area on the occasion of the first recording visit in May 2005, but when a second visit was made in mid-August, it was discovered that the area of the pond, and for probably 0.2ha round it, had grown up into a dense reed bed, through which it was necessary to fight to even catch a glimpse of the water. By that date (August 18th), no cattle had been introduced, and for the most part the larger and coarser plants were rampant, especially Angelica *Angelica sylvestris*, Hemp Agrimony *Eupatorium cannabinum* and Meadowsweet *Filipendula ulmaria*. All the plants present are those which can survive amongst vigorous competition. Ragged Robin *Lychnis flos-cuculi*, Marsh Bird's-foot Trefoil *Lotus pedunculatus* and Tufted Vetch *Vicia cracca* can always fight their way through. Just one or two Early Marsh Orchids *Dactylorhiza incarnata* were found, a species which is becoming increasingly uncommon. Unfortunately the picture drawn by Janet Negal can never be recreated because, as with most such sites, the imperative to take water from its source to the sea in as short a space of time as possible, has resulted in the ditches being dug too deeply, and cleaned out too often for the welfare of such an area of marshland as Hapton Manor Common. ***Alec Bull.***

The dense growth and coarseness of the vegetation excludes all but two or three of the commonest moss species to be found in this wet meadow habitat. However, a number of old elders growing on the bank at the southern end had an excellent epiphyte flora. In addition to the more common species for this habitat type, The Bryology Group found *Bryum subelegans, Cryphaea heteromalla, Syntrichia papillosa, Zygodon viridissimus* var. *viridissimus* and the liverworts *Erullania dilatata, Lophocolea bidentata* and *Lophocolea heterophylla* which are all new records for the hectad TM19. ***John Mott.***

The pond was visited on the evening of May 18th 2005 and surveyed for aquatic beetles and bugs. Twelve species of water beetles were recorded, the only one of note being the dytiscid, *Rhanthus suturalis*, Seven species of water bugs were also found, including the water stick insect *Ranatra linearis*, which was the most notable. Though a visit later in the year might have produced more species, the final list would be likely to be similar to any unpolluted pond in the county. The fen areas were too dry to support any aquatic species. ***Geoff Nobes***.

The terrestrial species of snails recorded represent a typical mixed-fen habitat as found in many parts of Norfolk. The presence of Desmoulin's Whorl Snail

Vertigo moulinsiana (Red Data Book 3) makes the site worthy of note. The diversity of aquatic species proved to be disappointing. The recently excavated pond contained remnant populations of just six species. The ditch, which takes the excess water from the pond to the stream, was in much better condition and it contained a small number of additional species. ***Derek Howlett.***

The rank vegetation over much of the site favours bush-crickets rather than grasshoppers. The only grasshopper species recorded from the site in 2005 was the Meadow Grasshopper *Chorthippus parallelus* which was found along the public footpath and in grassy areas along the northern border of the site. The Slender Groundhopper *Tetrix subulata* was found in areas of exposed mud where the public footpath approaches the footbridge at the southern end of the common. Dark Bush-cricket *Pholidoptera griseoaptera* was present in rank vegetation bordering the footpath and along the northern boundary of the common, where Speckled Bush-cricket *Leptophyes punctatissima* was also found. Short-winged Conehead *Conocephalus dorsalis* was present in small numbers around the shallow pool in the north-west corner of the common. This species is spreading in the county and it might be a recent coloniser of the site. There are no records from nearby Flordon Common which provides a better habitat of rushy meadows less dominated by reeds. ***David Richmond.***

PUBLIC ACCESS

As registered common land, the site is subject to the provisions of the Countryside and Rights of way Act 2000, which means that it has open access.

MANAGEMENT

The common is already under an ESA Agreement (Tier 2) which is due to run for another 6-7 years. Whilst the agreement is with DEFRA, the scheme is overseen by an experienced land agent in conjunction with South Norfolk District Council who are considering improving for public access such as an interpretation board, repairs to a footbridge and placing seats along the footpath. Other work being considered is the expansion and upgrading of the car park.

ACKNOWLEDGEMENTS

The Research Committee (Chairman Alec Bull) would like to thank the owner and Lord of the Manor Mr David Turner for inviting the Society to survey the flora and fauna, Mr Peter Riches, (Land Agent), Mr Michael Bentley (South Norfolk District Council) and Councillor Beverley Spratt for their support during the survey work.

Appendix: SPECIES RECORDED IN 2005

The Research Committee of the Norfolk and Norwich Naturalist's Society, under the direction of its Chairman Mr Alec Bull, has undertaken a number of surveys of the Common in 2005.

VASCULAR PLANTS List compiled by A.L. Bull, T. Dove, L. Hall, P. & J. Negal, and R.M. Richmond on various dates. The list must not be regarded as complete as one further early spring visit would be desirable to find missing species.

Equisetaceae	
Equisetum palustre L.	Marsh Horsetail
Dryopteridaceae	
Dryopteris dilatata (Hoffm.) A.Gray	Broad Buckler Fern
Dryopteris carthusiana (Vill.) H.P.Fuchs	Narrow Buckler Fern
Ranunculaceae	
Ranunculus acris L.	Meadow Buttercup
Ranunculus ficaria L.	Lesser Celandine
Ranuculus flammula L.	Lesser Spearwort
Ranunculus repens L.	Creeping Buttercup
Ranunculus trichophyllus Chaix.	Thread-leaved Water Crowfoot
Caltha palustris L.	Marsh Marigold
Papaveraceae	
Papaver rhoeas L.	Field Poppy
Cannabaceae	
Humulus lupulus L.	Hop
Urticaceae	
Urtica dioica L.	Stinging Nettle
Fagaceae	
Quercus robur L.	Pedunculate Oak
Betulaceae	
Alnus glutinosa (L.) Gaertn	Alder
Corylus avellana L.	Hazel
Chenopodiaceae	
Atriplex patula L.	Common Orache
Atriplex prostata Boucher ex DC	Spear-leaved Orache
Chenopodium album L.	Fat Hen
Chenopodium polyspermum L.	Many-seeded Goosefoot
Caryophyllaceae	
Cerastium fontanum Baumg.	Common Mouse-ear
Silene dioica (L.) Clairv.	Red Campion

Lychnis flos-cuculi L.	Ragged Robin	
Myosoton aquaticum (L.) Moench	Water Chickweed	
Moehringia trinervia (L.) Clairv.	Three-nerved Sandwort	
Stellaria media (L.) Vill.	Chickweed	
Stellaria neglecta Weihe	Great Chickweed	
Stellaria uliginosa Murray	Bog Stitchwort	
Polygonaceae		
Rumex conglomeratus Murray	Clustered Dock	
Rumex obtusifolius L.	Broad Dock	
Rumex sanguineus L.	Red-veined Dock	
Rumex acetosa L.	Common Sorrel	
Polygonum aviculare L.	Knotgrass	
Persicaria maculosa Gray.	Redshank	
Persicaria lapathifolia (L.) Delarbre.	Pale Persicaria	
Clusiaceae		
Hypericum tetrapterum Fr.	Square-stemmed St John's-wort	
Cucurbitaceae		
Bryonia dioica Jacq.	White Bryony	
Salicaceae		
Salix caprea L.	Goat Willow	
Salix cinerea L.	Grey Willow	
Brassicaceae		
Cardamine pratensis L.	Cuckoo Flower	
Coronopus squamatus (Forssk.) Asch.	Swine Cress	
Alliaria petiolata (Bieb.) Cavara & Grande	Hedge Garlic,	
Capsella bursa-pastoris (L.) Medik.	Shepherd's Purse	
Lepidium draba L.	Hoary Cress	
Sisymbrium officinale L.	Hedge Mustard	
Sinapis arvensis L.	Charlock	
Saxifragaceae		
Chrysosplenium oppositifolium L.	Opposite-leaved Golden Saxifrage Scarce in S. Norfolk; **new 10km square**	
Rosaceae		
Rosa canina L.	Dog Rose	
Rubus ulmifolius Schott.	Hedgerow Blackberry	
Rubus vestitus Weihe	Hairy Blackberry	
Rubus adspersus Weihe ex. H.E Weber		
Rubus boudiccae A.L. Bull & E.S. Edees	Boudicca's Blackberry	
Malus sylvestris (L.) Mill.	Crab Apple	A fine old tree
Filipendula ulmaria Moerch	Meadowsweet	
Crataegus monogyna Jacq.	Hawthorn	
Potentilla anserina L.	Silverweed	
Potentilla reptans L.	Creeping Cinquefoil	

Fabaceae	
Lotus corniculatus L.	Bird's-foot Trefoil
Lotus pedunculatus Cav.	Marsh Bird's-foot Trefoil
Vicia cracca L.	Tufted Vetch
Vicia sepium L.	Bush Vetch
Lathyrus pratensis L.	Meadow Vetchling
Trifolium pratense L.	Red Clover
Trifolium repens L.	White Clover
Onagraceae	
Epilobium hirstum L.	Great Hairy Willowherb
Epilobium parviflorum Schreb.	Small-flowered Willowherb
Epilobium ciliatum Raf.	American Willowherb
Epilobium tetragonum L.	Square-stalked Willowherb
Chamerion angustifolium (Raf.) Raf.	Rosebay Willowherb
Aquifoliaceae	
Ilex aquifolium L.	Holly
Euphobiaceae	
Mercurialis perennis L.	Dog's Mercury
Adoxaceae	
Adoxa moschatellina L.	Moschatel, Town Hall Clock
Geraniaceae	
Geranium robertianum L.	Herb Robert
Geranium dissectum L.	Cut-leaved Cranesbill
Apiaceae	
Apium nodiflorum (L.) Lag.	Fool's Water-cress
Angelica sylvestris L.	Wild Angelica
Heracleum sphondylium L.	Hogweed
Anthriscus sylvestris (L.) Hoffm.	Cow Parsley
Chaerophyllum temulum L.	Rough Chervil
Conium maculatum L.	Hemlock
Solanaceae	
Solanum dulcamara L.	Woody Nightshade
Convolvulaceae	
Calystegia sepium (L.) R.Br.	Hedge Bindweed
Boraginaceae	
Myosotis scorpiodes L.	Water Forget-me-not
Myosotis laxa Lehm Tufted	Tufted Forget-me-not
Mysostis arvensis (L.) Hill	Field Forget-me-not
Lamiaceae	
Stachys sylvatica L.	Hedge Woundwort
Galeopsis tetrahit	Common Hemp-nettle
Galeopsis bifida Boenn.	Bifid Hemp-nettle

Mentha aquatica L.	Water Mint	
Glechoma hederacea L.	Ground Ivy	
Lamium album L.	White Dead-nettle	
Lamium purpureum L.	Red Dead-nettle	
Oleaceae		
Fraxinus excelsior L.	Ash	
Plantaginaceae		
Plantago lanceolata L.	Ribwort Plantain	
Plantago major L.	Great Plantain	
Scrophulariaceae		
Scrophularia auriculata L.	Water Figwort	
Scrophularia nodosa L.	Common Figwort	
Veronica chamaedrys L.	Germander Speedwell	
Veronica arvensis L.	Wall Speedwell	
Veronica beccabunga L.	Brooklime	
Veronica persica Poir	Common Field Speedwell	
Odontites vernus (Bellardi) Dumort	Red Bartsia	
Rubiaceae		
Galium aparine L.	Cleavers, Goosegrass	
Galium mollugo L.	Hedge Bedstraw	
Galium uliginosum L.	Fen Bedstraw	
Caprifoliaceae		
Sambucus nigra L.	Elder	
Valerianaceae		
Valeriana dioica L.	Marsh Valerian	
Asteraceae		
Carduus crispus L.	Welted Thistle	A local species
Centaurea nigra L.	Common Knapweed	
Lapsana communis L	Nipplewort	
Picris echioides L.	Bristly Ox-tongue	
Sonchus arvensis L.	Corn Sow-thistle	
Sonchus asper (L.) Hill	Spiny Sow-thistle	
Sonchus oleraceus L.	Smooth Sow-thistle	
Senecio vulgaris L.	Groundsel	
Senecio erucifolius L.	Hoary Ragwort	
Senecio jacobea L.	Common Ragwort	
Arctium lappa L.	Greater Burdock	
Arctium minus (Hill) Bernh.	Lesser Burdock	
Artemisia vulgaris L.	Mugwort	
Aster sp [not in flower]	Michaelmas Daisy.	
Cirsium arvense (L.) Scop	Creeping Thistle	
Cirsium palustre (L.) Scop.	Marsh Thistle	
Cirsium vulgare (Savi) Ten.	Spear Thistle	
Eupatorium cannabinum L.	Hemp Agrimony	

Matricaria recutita L.	Scented Mayweed	
Matricaria discoidea DC.	Pineapple Weed	
Pulicaria dysenterica (L.) Bernh.	Yellow Fleabane	
Tripleurospermum inodorum (L.) Schultz-Bip	Scentless Mayweed	
Potamogetonaceae		
Potamogeton natans L.	Broad Pondweed	
Araceae		
Arum maculatum L.	Lords and Ladies, Cuckoo Pint	
Juncaceae		
Juncus bufonius L.	Toad Rush	
Juncus articulatus L.	Jointed Rush	
Juncus effusus L.	Soft Rush	
Juncus inflexus L.	Hard Rush	
Juncus subnodulosus Schrank.	Blunt-flowered Rush	
Cyperaceae		
Carex acutiformis Ehrh.	Lesser Pond Sedge	
Carex disticha Huds.	Brown Sedge	
Carex hirta L.	Hairy Sedge	
Carex nigra (L.) Reichard	Common Sedge	
Carex paniculata L.	Panicled Sedge	A notable population
Carex otrubea Podp.	False Fox Sedge	
Poaceae		
Festuca rubra L.	Red Fescue	
Festuca gigantea (L.) Vill.	Giant Fescue	
Arrhenatherum elatius (L.) P.Beauv. ex. J&C Presl.	False Oat-grass	
Glyceria maxima (hartm.) Holmb.	Reed Sweet-grass	
Glyceria notata Chevall.	Plicate Sweet-grass	
Holcus lanatus L.	Yorkshire Fog	
Holcus mollis L.	Creeping Soft-grass	
Phalaris arundinacea L.	Reed Canary-grass	
Phragmites australis (Cav.) Trin. ex Steud.	Common Reed	
Poa trivialis L.	Rough Meadow-grass	
Lolium perenne L.	Perenial Rye-grass	
Anisantha diandra (Roth.) Tutin	Great Brome	
Agrostis stolonifera L.	Creeping Bent	
Alopecurus myosuroides Huds.	Black Grass	
Bromopsis ramosa (Huds) Holub.	Hairy Brome	
Bromus hordeaceus L.	Soft Brome	
Phleum bertolonii DC	Smaller Cat's-tail	
Phleum pratense L.	Timothy	
Typhaceae		
Typha latifolia L.	Greater Reedmace. Bulrush	
Liliaceae		
Hyacinthoides non-scripta (L.)	Bluebell	

Iridaceae

Iris pseudacorus L. Yellow Flag

Orchidaceae

Dactylorhiza incarnata (L.) Söo Early Marsh Orchid

RUSTS collected and identified by Trevor Dove

Melampsora allii populina on *Arum maculatum*
Puccinea urticata on *Urtica dioica*
Triphragmium ulmariae on *Filipendula ulmaria*

FUNGI collected and identified by Alec Bull; 18.8.2005

Lactarius quietus (Fr.) Fr

PLANT GALLS recorded by Alec Bull 18.8.2005

Dasyneura ulmaria (Bremi) Galls on Meadowsweet, *Filipendula ulmaria*
Cystiphora sonchi (Bremi) Galls on Corn Sow-thistle, *Sonchus arvensis*
Lipara luscens Meigen. Cigar galls on Reed, *Phragmites australis*

BRYOPHYTES recorded by John Mott, Bob Ellis, Bob Finch, Richard Fisk, Mary Ghullam, Laurie Hall, Bill Mitchell, Pat Negal, Barry Nicholson, Robin Stevenson, David Seilly. 7.1.2006. Norfolk Bryology Group.

Mosses

Amblystegium serpens var. *serpens* (Hedw.) Br.Eur c.fr.
Aulacomnium androgynum Hedw.
Barbula unguiculata (Hedw.) Br. Eur.
Brachythecium rutabulum (Hedw.) Br. Eur
Brachythecium velutinum (Hedw.) Br. Eur c.fr.
Bryum bicolour Dicks
Bryum capillare Hedw.
Bryum subapiculatum
Bryum subelegans **New 10 km record**
Calliergonella cuspidata (Hedw.) Lees
Ceratodon purpureus (Hedw) Brid.
Cryphaea heteromalla (Hedw.) Mehr. c.fr. **New 10 km record**
Dicranoweisia cirrata (Hedw.) Milde c.fr.
Eurhynchium hians
Eurhynchium praelongum (Hedw.) Br. Eur
Funaria hygrometrica Hedw.
Hypnum cupressiforme Hedw.c.fr.
Hypnum resupinatum
Leptodictyum riparum (Hedw.)Wornst.
Orthotrichum affine. Brid c.fr
Orthotrichum diaphanum c.fr. Brid
*Physcomitrium pyriforme (*Hedw*)* Brid. On pond dredgings March 2000 P.Negal
Plagiomnium undulatum (Hedw.)Kop.
Pohlia melanodon
Rhynchostegium confertum (Dicks.) Br.Eur. c.fr.
Syntrichia papillosa **New 10 km record**
Tortula muralis var. *muralis* Hedw.

Ulota crispa c.fr. (Hedw) Brid. **New 10 km record**
Zygodon viridissimus var. *viridissimus* (Dicks) Rk. **New 10 km record**

Liverworts
Frullania dilatata (L) Dum. **New 10 km record**
Lophocolea bidentata (L) Dum. **New 10 km record**
Lophocolea heterophylla (Schrad.) Dum. **New 10 km record**
Lunularia cruciata (L) Dum. Ex. Lindb.
Pellia endiviifolia (Dicks) Dum.

MOLLUSCA recorded by Derek Howlett and Roy Baker. 12.3.2005

Hydrobiidae		
Potamopyrgus jenkinsi (Gray)	Jenkin's Spire snail	Common in drain.
Lymnaeidae		
Lymnaea peregra (Müller)	Wandering Snail	In drain and pond
Lymnaea palustris (Müller)	Marsh Pond Snail	In drain and pond
Planorbidae		
Gyraulus albus (Müller)	White Ram's-horn Snail	Common in pond
Hippeutis complanata (L.)	Flat Ram's-horn Snail	Common in pond
Ellobiidae		
Carychium tridentatum (Risso)	Slender Herald Snail	
Succineidae		
Succinea putris (L.)	Large Amber Snail	
Cochlicopidae		
Cochlicopa lubrica (Müller)	Slippery Moss Snail	
Vertiginidae		
Columella edentula (Drap.)	Toothless Chrysalis Snail	**RDB Cat 3 Rare**
Vertigo moulinsiana (Dupuy)	Desmoulin's Whorl Snail	In tussock sedges in lower fen.
Discidae		
Discus rotundatus (Müller)	Rounded Snail	
Zonitidae		
Vitrea crystallina (Müller)	Crystal Snail	
Aegopinella pura (Alder)	Clear Glass Snail	
Oxychilus draparnaudi (Beck)	Draparnaud's Glass Snail	
Oxychilus cellarius (Müller)	Cellar Snail	
Zonitoides nitidus (Müller)	Shiny Glass Snail	
Euconulidae		
Euconulus fulvus (Müller)		
Euconulus alderi (Gray)		
Clausiliidae		
Clausilia bidentata (Ström)	Two-toothed Door Snail	

Helicidae

Ashforda granulata (Alder)	Silky Snail	**European Biodiversity Species**
Arianta arbustorum (L.)	Copse Snail	
Cepaea nemoralis (L.)	Brown-lipped Snail	

Sphaeriidae

Pisidium personatum Malm.	Red-crusted Pea Mussel	In drain
Pisidium subtruncatum Malm.	Short-ended Pea Mussel	In pond
Pisidum nitidum Jenyns .	Shining Pea Mussel	In pond

LEECHES recorded by Roy Baker

Eropbdella octoculata (L.)		In pond

DIPTERA recorded by Roy Baker & Alec Bull

Lipara luscens Meigen.	Cigar galls on Reed	Common
Lucilia sp	Green Bottle	
Eristalis tenax L.	Dronefly	
Dasyneura ulmaria (Bremi)	Galls on Meadowsweet, *Filipendula ulmaria*	
Cystiphora sonchi (Bremi)	Galls on Corn Sow-thistle, *Sonchus arvensis*	

LEPIDOPTERA recorded by D.I. & R.M.Richmond 9.7.2005; Alec Bull 18.8.2005

Butterflies

Ochodes venata faunus (Turati)	Large Skipper
Pieris brassicae (L.)	Large White
Pieris napi sabellicae Stephens	Green-veined White
Maniola jurtina insularis (Thompson)	Meadow Brown
Aphantopus hyperantus (L.)	Ringlet
Pararge aegeria tireis (Godhart)	Speckled Wood
Polygonia c-album (L.)	Comma
Lycaena phlaeas L.	Small Copper
Inachis io (L.)	Peacock
Pyrania tithonus (Verity)	Gatekeeper
Polyommatus icarus Rott.	Common Blue

Moths

Agriphila straminella D&S.	
Pyrausta aurata Scop.	
Pleuroptya ruralis Scop.	Mother of Pearl
Ebulea crocealis Hübn.	
Camptogramma bilineata bilineata L.	Yellow Shell
Euphyia unangulata Haworth.	Sharp Angled Carpet
Autographa gamma L.	Silver-Y

GRASSHOPPERS AND CRICKETS recorded by D.I.Richmond 9.7.2005 and 12.8.2005

Pholidoptera griseoptera (Degeer)	Dark Bush-cricket	
Tetrix subulata (L.)	Slender Groundhopper	
Chorthippus parallelus . (Zett.)	Meadow Grasshopper	
Conocephalus dorsalis (Latr)	Short-winged Conehead	**New 10 km record**
Leptophyes punctatissima (Bosc)	Speckled Bush-cricket	

BUMBLEBEES recorded by D.I.Richmond 9.7.2005

Bombus terrestris (L.)	Buff-tailed Humble Bee	
Bombus lapidarius (L.)	Large Red-tailed Humble Bee	
Bombus pascuorum (Scop.)	Common Carder Bee	
Psythirus vestalis (Geoffrey)		
Vespula vulgaris (L.)	Common Wasp	18.8.2005 Alec Bull

COLEOPTERA recorded by Geoff Nobes 18.5.2005

Terrestrial beetles

Nicrophorus investigator	burying beetle	
Coccinella septempunctata	Seven-spot Ladybird	
Thea 22-punctata	22-spot Ladybird	

Water beetles

Noteridae

Noterus clavicornis (Degeer)	Larger Noterus	Common

Dytiscidae

Hydroporus planus	diving beetle	Common
Graptodytes pictus (Fab.)	diving beetle	Common
Agabus bipunctatus (L.)	diving beetle	Common
Ilybius fuliginosus (Fab.)	diving beetle	Common
Rhanthus sutaralis (Mac Leay)	diving beetle	**Notable N/b**
Colymbetes fuscus (L.)	diving beetle	Common

Hydrophilidae

Anacaena limbata (Fab.)	scavenger water beetle	Common
Anacaena lutescens (Stephens)	scavenger water beetle	Common
Laccobius bipunctatus (Fab.)	scavenger water beetle	Common
Enochrus testaceus (Fab.)	scavenger water beetle	Common
Hydrobius fuscipes (L.)	scavenger water Beetle	Common

AQUATIC HEMIPTERA AND HETEROPTERA recorded by Geoff Nobes 18.5.2005

Nepidae

Ranatra linearis (L.)	Water Stick Insect	Widely scattered

Corixidae

Corixa punctata Illig.	water boatman	Very common
Sigara dorsalis (Leach)	water boatman	Very common
Sigara fallenia (Fieb.)	water boatman	Very common
Sigara nigrolineata (Fieb.)	water boatman	Very common

Naurcoridae

Illycorus cimcoides (L.)	saucer bug	Widely scattered

Pleidae

Plea minutissima Leach		Widely scattered

BIRDS recorded by Alec Bull and others.

Snipe
Woodcock

	Mallard
	Pheasant (nesting with chicks)
	Chiffchaff
	Reed Warbler
	Reed Bunting (singing in reedbed)
	Spotted Flycatcher (family party 18.8.2005)
	Moorhen
MAMMALS	
	Grey Squirrel
	Hedgehog
	Fox
	NB Evidence of deer noted.
FISH	
Pungitius pungitius	Ten-spined Stickleback
AMPHIBIA	
Bufo vulgaris	Common Toad
Rana ridibunda *	Marsh Frog
Rana temporaria	Common Frog

* Introduced into the Tas river valley in the mid-20th century

Brown Hawker attacks migrating Small Whites

P. J. Heath

3 Lock Cottages, Lock Road, Honing, North Walsham, Norfolk NR28 9PJ

On the 16th July 2005 many butterflies of various species were feeding on bramble flowers just inland of the dunes to the south of Horsey Gap, including a large number of Large Whites *Pieris brassicae* and Small Whites *Pieris rapae*, part of a small visible migration from the continent that commenced on that date. At one bramble clump a Brown Hawker *Aeshna grandis* was patrolling slightly downwind and periodically darting down to the clump to attack the feeding butterflies. It was successful in four out of five attacks watched although there were several butterfly species present, each time it was a Small White that it captured and ate. Were these individuals tired and eager to feed after their flight across the North Sea and less wary?

The history and present status of *Solidago vigaurea* L. in east Norfolk – results of a survey by the Norfolk Flora Group

R.M. Leaney

122 Norwich Road, Wroxham, Norfolk, NR12 8SA

R.W. Ellis

11 Havelock Road, Norwich, NR2 3HQ

The native Goldenrod, *Solidago virgaurea,* is widespread in the British Isles, but it is far more frequent in the north and west of the country than it is in East Anglia. The *New Atlas of the British and Irish Flora* (Preston *et al.*, 2002) reported an overall decline in distribution with a change factor of -0.89.

Solidago virgaurea seems to have always been a scarce plant in Norfolk, mainly confined to the east of the county (vice-county 27). In west Norfolk (vice-county 28) it was always rare. Trist (1979) recorded a colony on a hedge bank at West Tofts before 1979, and Petch and Swann further colonies at Derby Fen, East Winch, Beetley and Gressenhall (Petch & Swann, 1968) . More recently it has only been found at Tottenhill Row and Gressenhall, (Beckett & Bull, 1999) and the species is now possibly extinct in west Norfolk (G. Beckett, *pers. com.*).

In east Norfolk it has probably always been rather scarce, but with a few dozen colonies and a fairly wide distribution, stretching from Sheringham and Holt down to the 'heathy' area to the north-west of Norwich, with a few colonies, mainly old records, just south-east of Norwich, and a very few, mostly even older, records across to Yarmouth or to the south.

Unfortunately the range of *Solidago virgaurea* in the east of the county also seems to have been contracting rapidly, with recent colonies virtually confined to the north-west corner of the vice-county, in the Holt and Sheringham areas.

It was therefore decided that the Norfolk Flora Group would survey the distribution of *Solidago virgaurea* in east Norfolk. We started off with the intention only of re-finding and surveying as many of the historical sites that seemed feasible or worthwhile, but in the course of the survey we realised that it should be possible to use the results to reach some sort of tentative conclusions as to the reasons for the loss.

METHODS

Fifty-three past records for *Solidago virgaurea* were found dating back to 1780. Sites where records were more than 30 years old were not revisited, nor were those where records only had hectad (10 x 10 km square) grid references. One 1988 record from East Tuddenham that "only survived for a few years" (A.L. Bull, *pers. com.*) was not revisited. On checking recent records with the recorders, four instances were found where the recorder could not remember the record, had no record of it, or was now unsure of the identification (in two instances the recorder was fairly sure that the species involved was *Solidago canadensis* and not *S. virgaurea*) and these were excluded. All other records had tetrad (2 x 2 km square) references, six-figure grid references, or a named locality and were included in the survey, which took place between 6th August and 3rd September 2003.

Whenever possible, the exact location of recent records was checked with the original recorders and this locality was visited. In addition, as far as possible, a general survey was conducted of all likely areas within the tetrad in which the record was made, i.e. open woodland and wood banks, heath, disused railways, road verges and especially steep road banks.

When found, a note was made of the size of each colony, but in some instances it proved difficult to count individual plants. *Solidago virgaurea* often divides an inch or so above ground level into three or more branches, and these branches only gradually curve upwards so that the flower spikes of a single plant are some distance apart. When the bases of these branches are covered with loose earth or leaf mould, which is often the case, it can be especially difficult to estimate the number of plants. It soon became clear that it was better to count flowering spikes. However, many of the earlier counts were of plants, as indicated in the list below (on average, approximately three flowering spikes are equivalent to one plant).

RESULTS

Details of colonies re-found

1 Sheringham Common TG 16394238 (16404240) 336 plants

This is the largest of all the surviving colonies, and is almost entirely within a solid stand of bracken, the plants growing unusually high so as to flower above the bracken fronds. There are numerous seedlings within the colony on the bare soil beneath the bracken, but it is not clear whether these seedlings will survive to flower beyond their first year, or whether they will be shaded out.

2 Beeston Common TG 16644239 (16624243 plants) 237

The second largest colony and the only other large one, but seemingly much more

threatened. It is partly to be found in an area of dry heath on the edge of a hillock, but extends down into a wetter zone on the edge of poor fen, where the goldenrod is at present much more prolific. However, among the fen vegetation that it grows with is a considerable amount of *Phragmites australis* which is likely to become much more confluent in time, and which will probably shade it out.

3 Beeston Common TG 16454232 Fewer than 20 plants

4 Beeston Common TG 16354215 Fewer than 20 plants
Two colonies not found by the flora group but re-found in 2003 (F. Farrow, *pers. com.*).

5 Sheringwood Green Lane TG 14814137 10 plants
This colony is on a grass island at the junction of an old established gravel track and a forestry track leading up into the conifer plantation to the west. There were seven plants on this island and three flowering among bracken on the edge of the plantation to the east of the track.

6 Holt Lowes TG 08723730 20 flowering spikes
Plants were scattered throughout an area of about 10m x 10m in *Molinia/Pteridium* heath with isolated gorse bushes and young birch and oak trees. It is possible that the area had been subject to burning some years previously.

7 Holt Lowes TG 0872937356 7 flowering spikes
A few plants were found in a small area of grass heath adjacent to bracken and young gorse and birch. The area had fairly recently been cleared of scrub.

8 Holt Lowes TG 0885737307 12 flowering spikes
This small colony was on the cleared edge of sloping, fairly mature birch woodland.

9 Holt Lowes TG 0891937316 4 flowering spikes
One or two plants in a slightly raised patch of ground within an area of heath and mire. Isolated patches of scrub had recently been removed (of which this was one) but some regeneration was apparent.

10 Holt Country Park TG 0851037856 22 flowering spikes
Several plants on either side of a wide path in a conifer plantation.

11 Disused Railway west of Holt TG 07163837 8 plants
A very small colony on the north bank of the old railway, densely shaded by trees.

12 Green Lane north of Hunworth TG 07403617 46 plants
A colony scattered for about 50 metres along both sides of a wide green lane which has a grassy field bank on one side, and a level verge some four metres

wide on the other bordered by a gappy hedge. Most of the colony is on this level verge that is becoming colonised by bramble. There are two typical associates in the vicinity: *Campanula rotundifolia* and *Teucrium scorodonia*.

13 Road verge Castle Hill East of Hunworth TG 07313513 18 plants
This colony is on a very high, nearly vertical road bank overhung by some spindly scrub and trees from adjacent woodland to the north, but with the south side open as there is no hedge or tree growth on the road bank opposite. Shading should therefore not be a problem. However, the bank is eroding rapidly, having little grass growth at all, and several uprooted plants were found in loose soil at the bottom of the bank.

14 Road verge south-east of Briston Common TG 06553111 4 flowering spikes
Another small colony (one plant?) on a very steep eroding road bank, but here also very heavily shaded by woodland overarching the road from both sides. It is almost certain that this plant is the last remains of a larger colony that has decreased due to shading, erosion, or both.

15 Road bank, Lady Lane, Hainford TG 231181 29 plants
A fairly stable colony known for 20 years, situated between the buttress roots of a very large beech, and associated with very sparse grass growth along with mosses, lichens, and a hawkweed (*Hieracium* sp); *Campanula rotundifolia* grows further along the bank a few yards away.

Quadrat samples

Quadrats with an area of 4 m^2 were recorded from 13 of these locations in order to study the associated species. The quadrat centre was chosen in such a way as to include the densest part of the colony and the most representative and consistent vegetation. Percentage cover of all species was recorded using the Domin scale. The main associates are shown in Table 1.

Analysis using MAVIS (MAVIS Plot Analyser Version 1, 2000) did not indicate a good correspondence with any NVC (National Vegetation Classification) community. The best matches were OV27 *Epilobium angustifolium* (= *Chamerion angustifolium*) community; W16 *Quercus* spp.-*Betula* spp.-*Deschampsia flexuosa* woodland and W23 *Ulex europaeus-Rubus fruticosus* scrub with coefficients of 40.7, 40.2 and 39.9 respectively. Given the marginal, partially wooded, nature of many of the locations, this poor match is hardly surprising.

Table 1. Floristic table derived from quadrats recorded at 13 colonies of *Solidago virgaurea*. The constancy (i.e. the proportion of quadrats in which the species occurred on a scale from 1 to 5) is shown in Roman numerals and the range of Domin scores is shown in brackets. Only species with a constancy of II or more are included (*S. virgaurea* itself is, of course, constant throughout and is also excluded).

Rubus fruticosus agg.	V (1-7)
Pteridium aquilinum	III (1-7)
Quercus robur seedling/sapling	III (1-4)
Hedera helix	III (1-5)
Agrostis capillaris	III (1-5)
Ulex europaeus	II (1-5)
Lonicera periclymenum	II (1-2)
Teucrium scorodonia	II (1-3)
Betula pendula sapling/regrowth	II (1-3)
Anthoxanthum odoratum	II (1-7)
Holcus lanatus	II (2-3)
Rumex acetosella	II (1-3)
Festuca ovina agg.	II (1-7)
Arrhenatherum elatius	II (1-6)
Chamerion angustifolium	II (1-4)
Molinia caerulea	II (1-6)
Sorbus aucuparia sapling	II (1-5)
Hieracium sabaudum group	II (1-2)

DISCUSSION

Habitat requirements and distribution of *Solidago virgaurea* in the British Isles

Solidago virgaurea is a perennial plant with wintering buds at soil level. It is much visited by flies, but is also automatically self-pollinated (Clapham *et al.*, 1962). This would suggest that seed production should not be a limiting factor, and this was confirmed during our survey by the presence of numerous seedlings in several instances.

It is described in the standard floras as a "common plant of dry woods and grassland, rocks, cliffs and hedge banks, dunes etc., on acid and calcareous substrata, throughout the British Isles, but rare in the south-east" (Clapham *et al.*, 1962), and as a plant of "open woodland, grassland, hedgerows, rocky places,

cliffs, frequent over most of the British Isles except parts of central England, central Ireland and the Channel Isles" (Stace, 1997) . The latter description implies that it is less frequent in central England than in East Anglia and further south, and this is confirmed by the *New Atlas of the British and Irish Flora*, which shows that Essex, Suffolk and especially Norfolk have been something of a stronghold for this species in recent decades (Preston *et al.*, 2002). It is however, much more common in the extreme south and southwest of England and especially in Wales, northwest England and Scotland.

The Generalised Soil Map of the Soil Survey of England and Wales (Avery *et al.*, 1974) shows a reasonable match between the distribution of 'Brown Earths' (well drained sandy or loamy non-calcareous soils) and the distribution of *Solidago virgaurea*, with a near-absence on loamy or clayey soils in flatter areas of the East Midlands and East Anglia.

Its seems therefore that *Solidago virgaurea* prefers well-drained soils, usually of low fertility and acid in reaction, but that it can tolerate damper, richer, and even calcareous soils in areas of high relief. It is also able to tolerate full sunshine and light to moderate shade, but not full shading (Fitter, 1978). Ellenberg values confirm this (Table 2). It is most successful in the uplands on cliff ledges, scree, stony banks and rocky open woodland. Putting all of this together, it seems fairly plain that the main determinant of its distribution is its poor competitive ability, and that its success in upland areas is because it is in such regions that it can find numerous niches that will remain in the long term both relatively unvegetated and not fully shaded.

Table 2. Ellenberg values for *Solidago virgaurea* (Hill *et al.*, 2004). Range of possible values given in brackets.

Ranges of values are given in brackets.

L (light 1-9)	5	Semi-shade plant, rarely in full light, but generally with more than 10% relative illumination when trees are in leaf.
F (moisture 1-12)	5	Moist-site indicator, mainly on fresh soils of average dampness.
R (reaction 1-9)	4	Indicator of moderately acid soils, only occasionally found on very acid or neutral to basic soils.
N (nitrogen 1-9)	3	Indicator of more or less infertile sites.

Possible causes of decline in lowland Britain

There is a fundamental difference between the low competition sites for *Solidago virgaurea* in the uplands, and those in the lowlands. The upland sites, though not in totally natural climax vegetation, are nevertheless in vegetation approaching that state, and therefore more inherently stable. Furthermore, open sites are ensured by inhibition of the herb, scrub and tree layers by rocky substrata. In contrast, the lowland sites with low competition, even the heaths or secondary woodland derived from heaths, are man made communities which are likely to be transient even with continuing management, and certainly with cessation of management subject to succession to a more closed community.

It is widely acknowledged that infertile road verges of the sort suitable for *Solidago virgaurea* have become increasingly dominated over the last two decades by competitive species like *Arrhenatherum elatius*, *Dactylis glomerata*, *Anthriscus sylvestris* or *Heracleum sphondylium*. This is usually put down to eutrophication from fertiliser drift and the leaving of grass cuttings, though the deposition of flailed hedge cuttings could also be a factor. The *New Atlas* analyses changes in our flora since the first Atlas of 1976, and comes to the conclusion that the most successful species have been those with high nutrient requirements and shade tolerance, with pH and moisture requirements less important, (Preston *et al.*, 2002) *The Causes of Change in British Vegetation* (Firbank *et al.*, 2000), however, puts greater emphasis on cessation of full-width cutting of verges since the mid-1980s as a factor in the loss of diversity in road verge floras, and this change correlates better in time with the observed loss of *Solidago virgaurea* over the last decade or two (flail cutting of verges began much earlier).

The road verge cutting that occurred until the early 1980s in May, and in late June or early July, might have especially suited *Solidago virgaurea*, which does not put on growth or flower until July and August. Furthermore, the semi-shaded and therefore sparsely vegetated zone immediately adjoining the hedge, which would have been a very suitable site for *Solidago virgaurea* with full-width cutting, has been increasingly invaded by coarse vegetation and by scrub, brambles and suckers spreading out from the hedge bottom.

An even more typical recent habitat than level road verges has been very steep road banks on narrow lanes, usually with little or no grass growth and supporting such species as *Teucrium scorodonia*, *Campanula rotundifolia*, or more rarely *Hieracium* species. These 'heathy' banks have been subject to increased erosion and undermining by traffic and especially by wide-based farm machinery. Such banks often adjoin woodland, so may also become shaded by overhanging trees due to lack of management.

Road verges are also, of course, affected by road works, leading to physical removal, burying, or disturbance and invasion by vigorous 'weeds'. Road-widening schemes, the digging of culverts and ditches, the laying of drains, and numerous other works have been increasing and could also have affected some sites in recent decades.

It might be assumed that *Solidago virgaurea* would be relatively safe on heathland, and that development of scrub and woodland on such sites would only result in reversion to the same sort of open woodland that was probably its original natural habitat in our region, but this would not seem to be the case. Pollen analysis shows that grasses and herbs such as buttercups, Ragged Robin and Devil's-bit Scabious, which do not flower in shade and which do not occur in modern woodland except in artificial 'rides', were of frequent occurrence in the 'wildwood' of Atlantic times, even before man began to clear the forest, (Rackham, 1990). The development of woodland took place in the presence of numerous large grazing animals already established on the post-glacial tundra, certainly Aurochs and Red Deer, but possibly also wild cattle. (Rackham, 1986a). These animals would have kept clear patches in the developing scrub, and then glades in the fully developed woodland; it was the semi-shaded lightly vegetated edges of these glades on poorer soils which were probably the original sites for *Solidago virgaurea* in the lowlands.

Scrub and woodland developing on modern heathland is likely to be very different, and not only because of the near absence of large grazing animals during its development. Soil fertility is likely to be greater than it was, and also different species are available for colonisation. Species like bramble and hawthorn have become ubiquitous in recent centuries through their presence in hedgerows, and are now prolific colonisers of heath along with scattered saplings of Birch or Oak, often producing a particularly dense scrub growth. *Solidago virgaurea* is unlikely to survive this scrub stage, even if glades were to develop later in subsequent woodland.

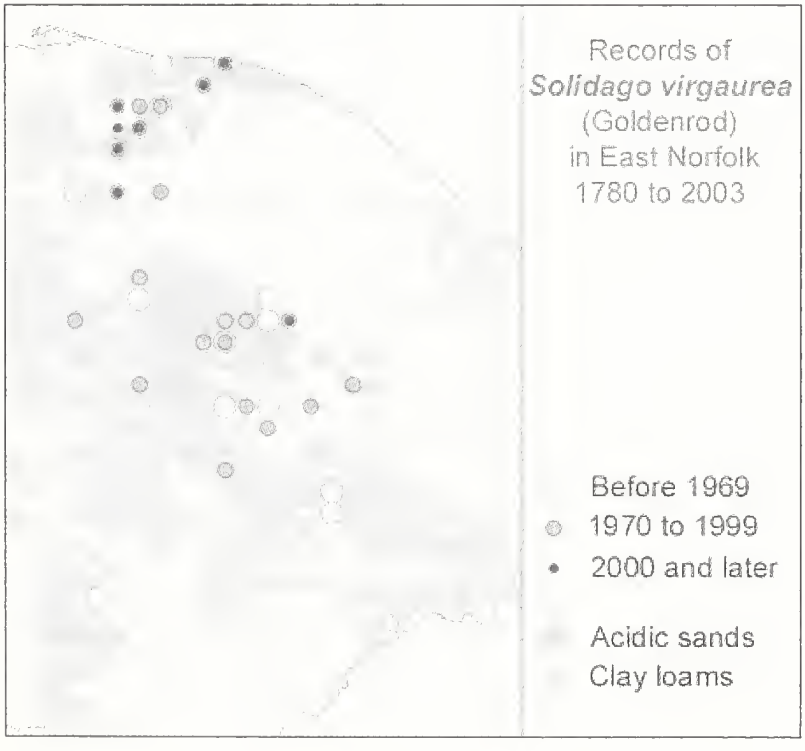
Unfortunately, glades seem to be dependent in recent times on management, and this management has largely ceased. The glades in primary woodland, and in the ancient secondary woodland succeeding it, seem to have survived in some attenuated form, despite the near absence of grazing animals, until recent decades. At first this was probably because of the characteristic pattern of regeneration in our woodlands, where only Beech and Yew can grow up in shade, so that regeneration only occurs in most woods when a glade has been formed by several trees falling (Rackham, 1990). Later glades were maintained or created by traditional management practices, not only by coppicing but also by the collection of firewood and bracken from the understorey, and the selective thinning of trees.

Cessation of these practices has been blamed for losses of some butterflies like the Small Pearl-Bordered and Silver-washed Fritillaries, (Asher *et al.,* 2001) and must have affected *Solidago virgaurea* in some regions. However, in Norfolk, the few woodland colonies found have been on recently developed woodland. Closing in of recent woodland is a likely reason for losses in the 'heathy' area to the north-west of Norwich in recent decades.

Distribution of historical records

The survey was based on 53 past records for *Solidago virgaurea* some with only a hectad reference and many with just a tetrad. A 'record' does not necessarily indicate one colony, and at one extreme each of these hectads or tetrads might have at some time contained many colonies or, at the other extreme, all the records for one hectad or tetrad might be for only one colony. The most meaningful measure of the historical status would be to assume that each of these hectads or tetrad records represented only one colony, thus giving an absolute minimum of colonies present at some time since 1780 in the vice-county. This gives a figure of 32 colonies. On the other hand we know that there are 5 colonies on Holt Lowes and Holt Country Park and four on Beeston and Sheringham commons; this gives the absolute minimum number of colonies present in east Norfolk at any time since 1780 as 39, present in 15 hectads. It is interesting to compare these figures with the 26 colonies in 23 hectads present at some time in Essex (Jermyn, 1974); it would appear that Norfolk has been something of a stronghold for this species in the east, but always in a rather restricted area.

Figure 1. Modern and historical distribution of *Solidago virgaurea*. Only records that can be reasonably well localised to a tetrad (2 x 2 km grid square) have been included.



The historical records for east Norfolk are shown in Figure 1. As with the British Isles distribution, the east Norfolk distribution correlates well with the Brown Earths on the Soil Map of England and Wales (Avery *et al.*, 1974). A local soil map for Norfolk has been produced by Corbett and this shows that nearly all the records are either on his soil Type 7 (well-

drained loamy over clay soils on chalky drift) or on soil Type 11 (deep well-drained sandy soils, some very acid and podsolised).

Rackham (1990) provides a map of Norfolk wildwood based on work by Birks (Birkset *et al.,* 1975) and his own work (Rackham, 1986b), which shows a north-central to south-east crescent of wildwood comprised of Lime-Ash-Hazel-Elm, with purer lime woodland to the north-east and Lime-Hazel-Oak to the south-west. Records of Goldenrod since 1780 all occur on this crescent where Lime-Ash-Hazel-Elm woodland used to be, which stretches down from the Holt-Cromer ridge area through the Wensum Sands and through what is now Norwich towards the south-east. It seems likely that natural glades in less shady woodland with more Ash and Elm were the main primeval sites for *Solidago virgaurea* in Norfolk.

Distribution of colonies re-found, and possible causes of decline in east Norfolk

Of the 15 colonies re-found (see Figure 1), nine were on heathland and these colonies now represent 72 percent of the Norfolk population; of these, three were on Beeston Common, one on the adjoining Sheringham Common, and five on Holt Lowes or Holt Country Park. The two largest colonies, one on Beeston and one on Sheringham Common, had 237 and 336 plants respectively.

All of these sites are on the poorest soils in Norfolk (Type 11) and all appear never to have been cultivated, with the possible exception of Holt Country Park. Perhaps these heathland areas represent 'primary' sites where *Solidago virgaurea* has been constantly present since its original establishment in the glades of open woodland in post-glacial time, glades which would have been larger and less vegetated because of the extremely poor soils, and also perhaps less shaded because of the particular tree mix, with more Ash especially, casting less shade. The clearance of the woodland to produce heath might have actually resulted in an increased population for many centuries.

It could well be that *Solidago virgaurea* persisted on 'heath' throughout post-glacial prehistoric times. Vera (2000) has suggested that species composition in Central and Western Europe was governed through this period by large herbivores, producing not closed woodland but a 'park-like' landscape of grasslands, scrub, solitary trees and groves. Such a habitat on the poorest soils might have been similar to the heath where Goldenrod grows most successfully in Norfolk today.

Of the six other extant colonies, three were on steep roadside banks, two on old green lanes, and one on a disused railway embankment. These and the records north west of Norwich not re-found form two quite distinct groups, one centred

on the Type 11 soils of the Holt-Cromer ridge, and the other on the similar soils of the Wensum Sands. It is pretty clear that heaths on these two areas have been the 'reservoir' for colonisation of surrounding man made sites over the centuries. There is striking circumstantial evidence of this from an observation around thirty years ago of Goldenrod being present for many miles along roadsides passing through the heaths of the Wensum Sands (A.L. Bull, *pers. com.*).

The chronology of records since 1780 also supports the idea that heaths acted as long term reservoirs of population. There are only nine instances where records have occurred more than once for the same hectad (suggesting long- term persistence) and all of these are on areas of Type 11 soils where heath still exists today, or is known to have existed in the past. These records sometimes span considerable periods, stretching from 1928 until the present for the Holt Lowes heathland, from 1968 till the present for the 'heathy' Beeston and Sheringham Commons, and from 1866 to 1991 for Felthorpe. Records for the Poringland area, where heath was also once present, occur for 1886 and 1968.

In contrast all the other 44 'one-off' records are away from Type 11 soils, suggesting that colonies on richer soils have been transient, probably persisting only a few decades. A recent one at East Tuddenham found in 1988, persisted only a few years as already mentioned, and one at Hethersett in 1999 had disappeared when re-checked in 2003 (J. Mott, *pers. com.*).

There is good historical evidence that heath has been a long-term feature in each of the three centres of population. Faden's map of 1797, as interpreted by Barringer (1993), shows large areas of 'common heath' at Beeston Common south of Sheringham and both north and south-east of Holt (Holt Lowes). There was another very large heath in the parishes of Horsford and Hainford, over half of which parishes were heath in 1797, from which the considerable concentration of recent records from the Wensum Sands area could have been derived. To the south and east of Norwich the historical population is sparse and stretched over many decades, with only ten records since 1886, which is perhaps surprising given the enormous extent of Mousehold Heath in the past. Faden's map shows heath as far as Salhouse, Woodbastwick and Blofied in 1797, as well as another small patch of heath south-east of Norwich in the Poringland area. However, 'heath' on Faden's map does not necessarily indicate heath in the ecological sense, and the poorest Type 11 soils that would support true heath only occur in four very small patches in this area (see Figure 1).

The time of disappearance of records from the three main areas of population also supports the concept of central reservoirs of population on heath, with transient satellite colonies ceasing to appear as heath is lost through ploughing, afforestation or natural succession to woodland. In the Sheringham and Holt

areas, where some open heath still survives, 14 of the original minimum 20 colonies survive, and by far the largest are on heath. In the Wensum Sands area, where heath has been lost to afforestation and succession to woodland within living memory, only one colony survives, but 8 out of the 12 minimum colonies survived until the last 30 years. To the south and east of Norwich, where the whole of 'Poringland Heath' and most of Mousehold Heath disappeared between Faden's map of 1797 and the OS map of 1838, with loss of all heath on Type 11 soil during this period, only three definite records of the original minimum of 14 survived until the last 30 years. The last one, on heath was on Mousehold Heath, found in 1971, and not re-found in 2003. A roadside colony at New Rackheath and one at Hethersett, both found in 1990, were both not re-found in 2003. Of all the 39 colonies present since 1780 none away from Type 11 soils is known to have survived for more than a decade or two.

The fact that the 44 'non-heath' records since 1780, out of a total of 53, seem not to have persisted for more than a decade or two suggests that the heath colonies are primary, although it is not in itself proof.

The second edition of the *Atlas of the British flora* in 1975 (Perring *et al.,* 1976) shows Goldenrod occurring in 13 hectads in Norfolk, and the *New Atlas of the British and Irish Flora* of 2002 (Preston *et al.*, 2002) shows it in 17 hectads. Yet in 2003 we find that it is only present in three hectads. Although the text in the *New Atlas* does mention that "populations in lowland Britain are disappearing due to habitat loss", and such losses can be obscured by better recording in the *New Atlas*, as far as Norfolk is concerned this is still a striking discrepancy.

The unexpected vulnerability of Goldenrod in the county seems to be due to the fact that transient colonies are quite suddenly not being replaced, and this is presumably because potential sites are no longer suitable. To the south and east of Norwich this was probably because of eutrophication mainly, but on the Wensum Sands and Holt-Cromer ridge shading of potential sites by secondary woodland appears to be the main change responsible. In these two areas, always the stronghold of the species in Norfolk, there are many possible roadbank and other sites not related to agricultural land that are now heavily shaded by encroaching woodland.

It is of concern that the atlas maps of 1975 and 2002, in which the populations appeared to be stable, did not predict the demise of Goldenrod in the county. One way to attempt this prediction for other scarce perennial species with poor colonising ability would be to look in more detail at the chronology of all records of such species and to derive an 'index of vulnerability' from the proportion of old records that are transient (i.e. not recorded more than once).

CONCLUSIONS

The 53 past records for Goldenrod in Norfolk relate to a minimum of 39 colonies since 1780. Although this number of colonies has probably never been present at one time, 33 seem to have been present in 1973, 30 years ago. The number has now declined to 15, of which nine are confined to two heathland sites in the Holt-Cromer ridge area. The remaining six non-heath colonies are small (maximum 46 plants) and only two seem to be safe at present without conservation measures. Even the heath sites may not survive in the longer-term without appropriate management.

The past distribution of Goldenrod in the county is similar to that of Lime-Ash-Hazel-Elm woodland in Atlantic times, and it is possible that the species was confined to this climax community at that time, denser woodland in the rest of the county being unsuitable. Certainly it would seem more recently to have been confined by its poor competitive ability and intolerance of heavy shade to the poorest soils, which are able to provide similar habitat conditions to the rocky substrates in the uplands.

Virtually all records of *Solidago virgaurea* occur either on the poorest Type 11 or Type 7 soils. Heathland on the former soil supports 72 per cent of the county population and the only two large colonies (of 237 and 336 plants). Past records from heath or from areas where heath is known to have existed have been recorded repeatedly, over periods of up to 125 years, and surrounding non-heath records have disappeared shortly after heathland has been forested or ploughed up. Non-heath sites have never been recorded more than once and have not been known to survive for more than a decade or two.

All this suggests that heathland colonies may be primary and that they may have acted as reservoirs of population, from which the transient non-heath colonies have been derived.

Our findings may also add support for Vera's hypothesis that there was never a closed wildwood in Atlantic times, but rather a park-like landscape maintained by large grazing herbivores. If Vera's 'park-land', on the poorest soils, was similar to the heaths where Goldenrod appears to have survived best over the last two centuries in Norfolk, his hypothesis would provide an explanation for its survival through Atlantic times.

The national atlas maps showed Goldenrod in 13 Norfolk hectads in 1962, (mainly recorded 1950-1960) and 17 in 2002 (recorded 1987-2000), but our short survey in 2003 found it in only three hectads. Analysis of the atlas records indicates that most were for transient satellite colonies, recorded only once. The loss of core heathland sites and the recent unsuitability of potential sites for satellite colonies, due mainly to shading by secondary woodland, pose a greater

threat to the survival of *Solidago virgaurea* in Norfolk than might be concluded from the *New Atlas* distribution.

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Orthoptera Report 2005

David Richmond

42 Richmond Rise, Reepham, Norfolk, NR10 4LS

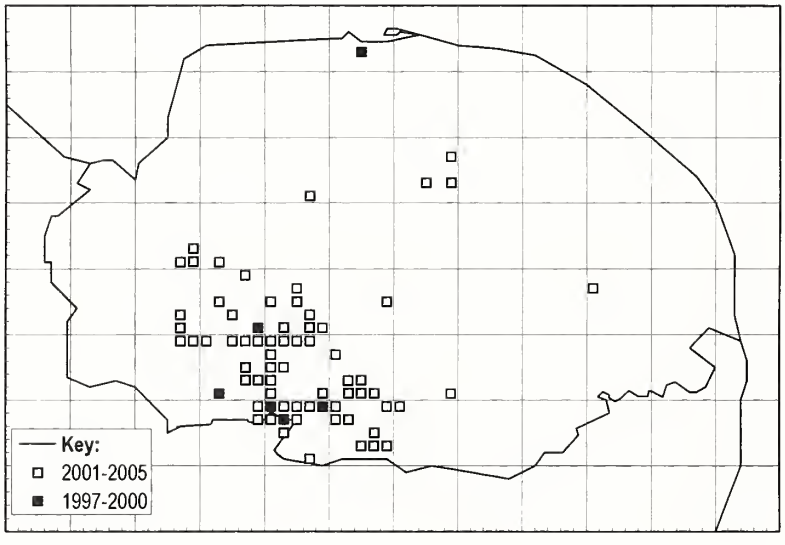
Five years have passed since the publication of the millennium maps in the *Grasshoppers and Allied Insects of Norfolk* (Richmond, 2001). These years have witnessed significant expansions in the ranges of Roesel's Bush-cricket, Long-winged Conehead and Lesser Marsh Grasshopper, and a consolidation of our knowledge of the distribution of Short-winged Conehead. A major highlight of the period has been the rediscovery of Stripe-winged Grasshopper in the north-west of the county, where it is now known to be quite widely distributed. In all cases the increase in knowledge is attributable to the use of a bat detector to increase the distance at which species can be heard, and to bring ultrasonic stridulations within the range of human hearing.

These five species are discussed below and new distribution maps are presented. In these maps, open squares represent post-2000 records, and solid squares relate to the 1981-2000 recording period.

Roesel's Bush-cricket

Metrioptera roeselii

This species is now strongly established throughout the Brecks, with the extremities of the main distribution being Weeting, Wereham, Shouldham, Litcham, Cranworth and New Buckenham. An outlier colony at Reepham demonstrates its ability to turn up almost anywhere in the county as a result of hot weather movements. The Reepham colony also provides an insight into the manner of dispersal. In the hot summer of 2003, stridulating males were heard on a single occasion from two sites close to the Marriott's Way to the west of Reepham. A fortnight later another individual of the long-winged form was seen and heard 2 km further north at Wood Dalling. Two years later in July 2005 a small colony was discovered within 200 metres of the original Marriott's Way site. As the species has a two-year egg cycle, this strongly suggests that the weather



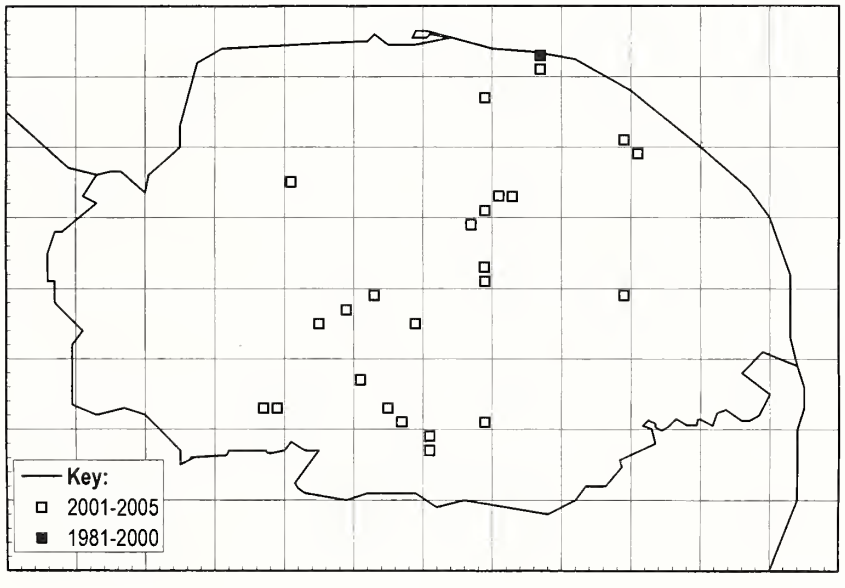
conditions which brought the macropterous males to Reepham in August 2003 also brought females, and that the colony discovered in 2005 represents the progeny of that dispersal.

It is believed that the distribution map above depicts a genuine dispersal during the 5-year period, and that only a small number of the new squares represent previous under-recording. Many sites had been visited throughout the period, with the species only becoming evident during the later years of the study.

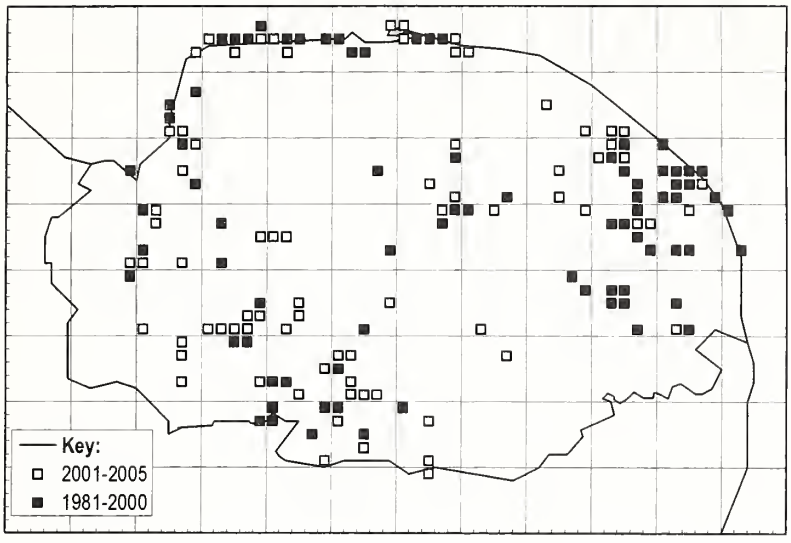
Long-winged conehead

Conocephalus discolor

Apart from the original site at Beeston Common, this species was not re-found in the county until 2003, when a single male was seen and heard by the North Walsham and Dilham canal just to the south of Bacton Wood. Targeted research over the next two years showed there had been a sudden and explosive colonisation of the county, with a substantial number of sites now known in the Breckland area and a cluster of records in the author's home patch around Reepham. Many of these sites had been visited in previous years as part of the author's research into Short-winged Conehead, so it is known that the 2004-5 records represent genuine, recent colonisation.



The species flies strongly and has a single-year egg cycle so that new populations can build up quite quickly. All the evidence points to warm weather dispersal in the hot summer of 2003, from previously unknown colonies in the Brecks, where it often forms difficult to identify mixed colonies with Short-winged Coneheads. Sites with good public access include Cranwich Heath, New Buckenham Common, Whitwell Common, Booton Common, Holt Lowes, Pygney's Wood (North Walsham) and Beeston Common (Sheringham). Other colonies are on roadside verges, waste ground or set aside, especially where there are areas of dry grassland with fat hen, creeping thistle or dock.



Short-winged Conehead

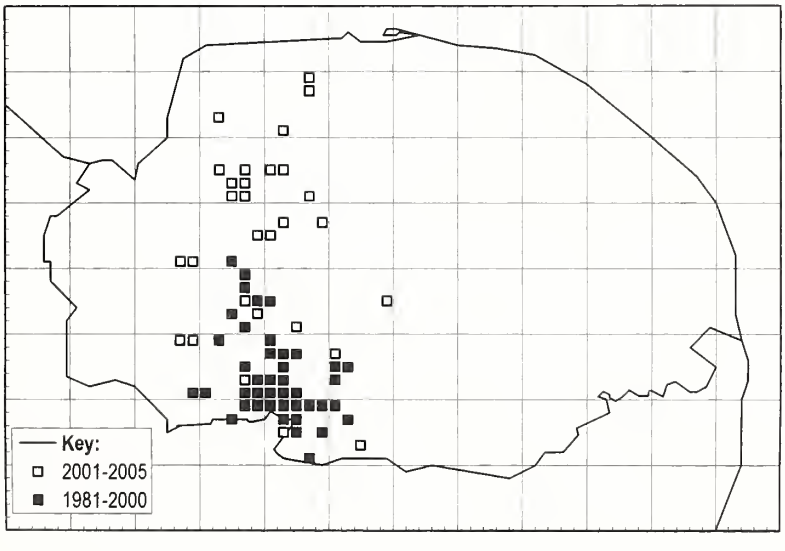
Conocephalus dorsalis

The new squares on the map of Short-winged Conehead are believed to represent previously undiscovered colonies rather than range expansion. Continuing research with a bat detector has identified many more colonies away from the traditional strongholds in the broads and coastal dune systems. New 10 km square records have come from Denver, Methwold Fen, Castle Acre, Gt Cressingham, Wymondham, Hapton Common, Gunton Park, Little Hautbois and Belaugh. As with Long-winged Conehead the single-year egg cycle has permitted significant population growth in hot summers and many colonies are now more extensive than when first discovered.

Stripe-winged Grasshopper

Stenobothrus lineatus

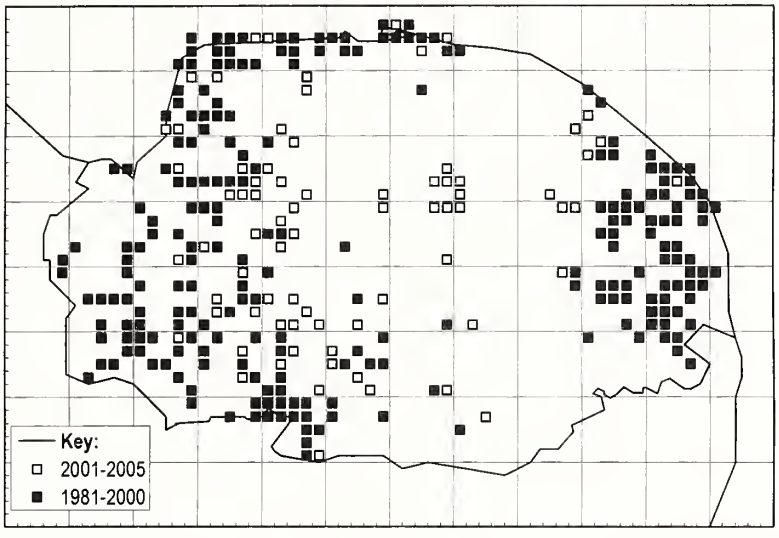
At the end of the 20th century, Stripe-winged Grasshopper was known only from the Brecks, with a single tantalising record from the north-west of the county dating back to the 1920's. Then in 2001 the author discovered a colony at Whin Hills, North Creake, the first record from north-west Norfolk for over 80 years. Inspired by this, he began a programme of research in that part of the county leading to the discovery of colonies over a previously unsuspected wide area. It is now known from Massingham and Grimston Heaths, roadside verges at Shernborne, restored common at West Rudham and Syderstone, and cleared forestry at Shouldham Warren. It has also been found at Litcham Common, Cranworth, Castle Acre, and the cut off channel at Wretton. Many naturalists suspect that it could also occur at Winterton Dunes and confirming its presence



there remains a major challenge for the years ahead. It is best searched for with a bat detector on hot sunny days between mid-July and mid-August when its presence might be betrayed by its distinctive wheezing stridulation.

Lesser Marsh Grasshopper

Chorthippus albomarginatus



This map shows a mixture of tetrad infilling within the established 20th century distribution, plus post-2003 dispersal to new sites in the centre of the county. Again, the Reepham cluster provides evidence of warm weather dispersal with new records from previously well-worked areas.

Other records of note from the 2005 season

Perhaps the most unexpected record of the year was **Great Green Bush-cricket** from two new tetrads in the east of the county. Keith Knights had three singing males at Belton and a single at Burgh Castle. **Bog Bush-cricket** has been reported from a new site at Marsham Heath, about a kilometre north of the well-known Buxton Heath colonies. **Common Groundhopper** was found in a new 10km square at East Tuddenham (TG01) while **Mottled Grasshopper** was discovered in two new 10km squares at Litcham Common (TF81) and beside the cut-off channel at Wretton (TL69). Finally, Phil Heath discovered **Lesser Earwig** in a new 10km square at Ormesby Broad (TG41). The only extreme date of interest was **Short-winged Conehead** at Kelling Hard on 12 November (a full nine days later than the previous latest date for this species in Norfolk). Other November dates were Dark Bush-cricket (10th), Speckled Bush-cricket (15th) and Field Grasshopper (18th).

Plant notes for West Norfolk 2005

Gillian Beckett

Bramley Cottage, Stanhoe, King's Lynn, Norfolk PE31 8QF

As usual, records have been sent in to the County Recorders both as a result of field meetings, both those organised by the Norfolk Flora Group and those of the N.N.N.S. The Flora Group visited the formerly afforested area of Fulmodeston Common, lying adjacent to Swanton Great Wood. The site was visited twice and proved to have a wide diversity of finds, some relics of the nearby deciduous woodland, but of most interest those which owed their origin to the wet Common on which the plantation was originally made. *Carex binervis*, *Ulex galli* and its hybrid with *U. europaea* were found together with both *Erica cinerea* and *Erica tetralix*, an indication of a wet, acid site, while it was pleasing to find two colonies of *Perscaria minor* in different parts of the area, this is now an endangered species. Oxburgh Hythe, visited in summer, proved to be a very varied site with *Peucedanum palustre* and *Hottonia* in a pool while there were also ant heaps with chalk loving plants. At Blo' Norton fen, greater burnet, *Sanguisorba major*, was re-found on ditch banks, this plant which is known from Suffolk was first found at the same site by Eric Swann in 1968, while colonies of *Filago lutescens* Red-tipped Cudweed and Narrow-leaved Hemp-nettle *Galeopsis angustifolia*, both endangered species were found to be thriving at Snettisham.

Observant individuals added to the score, Ron Payne starting the year with a new tetrad for *Blechnum spicant* at Shouldham Warren and ending with established Shama Millet *Echinochloa colona* in a guttering at Tottenhill while in October Bob Leaney, visiting Stiffkey for a churchyard survey, found Rescue Brome *Ceratochloa cathartica* in the church car park. A mild October proved productive for other recorders with Guernsey Fleabane *Conyza sumatrensis*, found at Thetford Station in October by Arthur Copping and Red-tipped Cudweed, *Filago lutescens* at Santon by Nick Gibbons. This is just a selection of the many finds made during the year.

Progress was also made on the surveys being carried out but more records are needed, particularly for Harebell *Campanula rotundifolia*. While mapping Alexanders *Smyrnium olusatrum*, will have to end after this summer as will the work on the local subspecies of *Limonium binervosum*. The study of Goldenrod is complete; Bob Leaney's and Bob Ellis's account is in this journal.

Summary of records

Amaranthus hybridus TL867836 Thetford: A. Copping

Blechnum spicant	TF672101	Shouldham Warren: R.M. Payne
Ceratochloa cathartica	TF974430	Stiffkey church car park: Dr R.M. Leaney
Carex binervis	TG005310	Fulmodeston, cleared forest: Flora Group
Conyza sumatrensis	TL867836	Thetford: A. Copping
Echinochloa colona	TF645115	Tottenhill: R.M. Payne
Erica cinerea	TG006310	Fulmodeston, cleared forest: Flora Group
Erica tetralix	TG006310	Fulmodeston, cleared forest: Flora Group
Filago lutescens	TL797878	Weeting, forest track: N. Gibbons
Persicaria minor	TG004310	Fulmodeston, cleared forest: Flora Group
Peucedanum palustre	TF732009	Oxburgh Hythe: Flora group
Ulex europaeus x gallii	TG005310	Fulmodeston, cleared forest: Flora Group
Ulex gallii	TG005310	Fulmodeston, cleared forest: Flora Group

The discovery of *Platydema violaceum* (Fabricius) (Coleoptera: Tenebrionidae) in Norfolk

Bryan Sage

Waveney House, Waveney Close, Wells-next-the-Sea, Norfolk NR23 1HU

Whilst collecting coleoptera on the Stanford Training Area (TL8693) on 15th October 2005, I found a dead fallen oak that was partially decayed, but was not a very old tree. On lifting a section of bark I found some half a dozen species of beetle, all on or close to a patch of fungal hyphae, probably *Stereus gausapatum*. They included two medium-sized dark beetles that exhibited a bluish-violet sheen. Although clearly belonging to the family Tenebrionidae I knew immediately that they were a species that I had never seen before. Later, having returned home, I consulted Brendel (1975) where they quickly keyed out to *Platydema violaceum*, a totally unexpected result. Some time later I showed one of the specimens to Martin Collier who confirmed my identification.

This beetle has always had a very restricted distribution in Britain and is listed by Hyman (1992) as Red Data Book Category 1 – Endangered (i.e. in danger of extinction). On the Joint Nature Conservation Committee (JNCC) website it is included in the list of insects that have become extinct in Britain during the last 100 years. If we exclude an aberrant record of one taken at light at Juniper Hall Field Centre on 11th August 1957 (Sankey, 1957), then it had only ever been found in the New Forest, South Hampshire, where it was last seen in 1901 (Donisthorpe, 1901).

The discovery of this supposedly extinct beetle in Norfolk at a site approximately 250 kilometres north-east of the New Forest is a most extraordinary event, and one that it is difficult to explain. Is the species really absent everywhere between

the New Forest and Norfolk, or will it be found elsewhere in due course? The New Forest is a site that has been consistently well worked by coleopterists, yet nearly 105 years have elapsed since it was last seen there. A more detailed account of this find is being published elsewhere (Sage, 2006).

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SANKEY, J., 1957. *Platydema violaceum* (F.) (Col., Tebenrionidae) in Surrey. *Ent.Mon..Mag.* **93**:278.

Some notable insect records from a site at Marriotts Way, West Norwich, including the bug *Syromastes rhombeus* (Linnaeus)

Stuart Paston

25 Connaught Road, Norwich NR2 3BP

On 6 September 2005 I was walking along a track atop an embankment between Marriott's Way and Sloughbottom Park,West Norwich, TG 208099 when my attention was drawn to a bug in slow flight close to the ground in front of me. It alighted briefly on a plant stem beside the track, allowing close scrutiny, and I was immediately struck by its peculiar diamond-shaped abdomen. It was not a species I had seen before but this distinctive aspect of its appearance allowed me to subsequently identify it as *Syromastes rhombeus* (Linnaeus) with reference to the illustration in the Collins Guide to the Insects of Britain and Western Europe by Michael Chinery (1986).

This Coreid bug was first recorded from Norfolk in 2004 by Mike Toms (2005) who found it at Cranwich in the Breck. Its discovery well away from Breckland is therefore of interest and would seem to provide evidence that the site concerned, a sandy area on the northern edge of the Wensum Valley is of local significance. Whilst no concentrated site study has been undertaken, infrequent visits by the author have yielded several noteworthy insect records in recent years.

On 30 July 2000 an individual of the local Sulphur Beetle (*Ctenopius sulphurous* Linnaeus) was noticed feeding at pollen from Wild Carrot *Daucus carota* alongside a pathway not far from where the *S. rhombeus* sighting was made. No further observations were made so residency cannot be confirmed, but the sighting is still of considerable note as all previous Norfolk records have been from the Breck or coastal sites (Martin Collier, *pers.com.*).

In the summer of 1999 I collected a number of hymenopterans within the same area including two species of Sphecodes bees that are cleptoparasites in the nests of ground nesting bees. These have been identified by George Else as *Sphecoides puncticeps* Thomson and *S. reticulatus* Thomson - both rather local species with a wide distribution in Southern England. They were taken flying about a very sparsely vegetated south-west facing embankment that had been recently created by the construction of a new cycle way. The occurrence of such plants as Common Centaury *Centaurium erythraea* and Buck's-horn Plantain *Plantago coronopus,* the latter uncommon inland, gives a good indication of the bare sandy conditions prevailing. Another local parasitic bee, found to be common at Ragwort *Senecio jacobae* in 1999, was *Epeolus variegates* (Linnaeus) which is likely to be scarce, if not absent outside the Breck and suitable coastal locations.

All these observations were made in a rather circumscribed area close to the south-west perimeter of Sloughbottom Park. Further west, the sandy ridge, before leading on to scrub and woodland, is flanked by open ground supporting ruderal vegetation: the last fragment of a once much larger extent of waste ground in the area. Although this site is part of a wider undeveloped area encompassing the Sweet Briar Meadows to the south, its drier sandy conditions mark it out as distinctive and it clearly has the potential to support insects that are uncommon in inland East Norfolk.

Acknowledgements

I would like to thank Martin Collier for clarifying the Norfolk distribution of *Ctenopius sulphurous* and George Else for identifying the Sphecodes specimens and providing additional helpful information.

Reference

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OBITUARY: **Reg Evans 1915-2004**

Tony Leech

When Profesor Roy Watling, one of the few professional mycologists working on larger fungi in Britain, wrote his paper on the role of the amateur mycologist (Watling, 1998) Reg Evans was one of only five amateurs alive in the closing decade of the 20th century to receive special mention. Unfortunately, Watling not only got the year of Reg's birth wrong he also failed to mention his partnership with his wife Lil! Those of us who knew the couple, however, were very much aware that 'Reg 'n Lil' operated in tandem. I first met them when, as a diffident schoolboy, I joined the Birmingham Natural History Society and was taken under their wing. At the first field meeting I attended, Reg picked a dead branch from the ground and, lens to eye, read off the microfungi along it as Lil wrote the names down - and occasionally corrected him.

Reg Evans was born in Norwich in 1915 and attended Angel Road School before moving on to the King Edward VI Grammar School (now Norwich School) where he excelled in chemistry and physics. On leaving, he joined Jarrold's as an apprentice pharmacist and studied further to gain entry to the College of the Pharmaceutical Society in the University of London, where he qualified. He married Lil in 1938 and they had two daughters before Reg was called up in 1942. After the war, he took a post with Timothy Whites and Taylors in Lowestoft before moving to their branch in Stratford-upon-Avon in 1950 (hence his association with the Birmingham society). After spending the last five years of his working life in Sutton Coldfield, he and Lil retired to his county of birth in 1975.

Whilst in Warwickshire, Reg and Lil were major contributors to the Fungus Flora of Warwickshire (Clark, 1980), the first ever county mycota and one which set the standard for subsequent publications. This effort involved visiting 25 1 x 1km squares three times year for over ten years as well as being responsible for all pyrenomycete and aphyllophorales records. And all this while working full-time – he fully deserved his Benefactor's Medal from the British Mycological Society.

Reg found at least seven species of fungus new to Britain and a larger number which could not be identified by the experts at Kew. The pyrenomycete *Rosellinia evansii*, new to science was named in his honour. Since returning to Norfolk, Reg and Lil made more than 35000 records of nearly 2000 species, all of which have now been entered on to the national database held by the British Mycological Society, incidentally making them the largest single contributor.

Reg published papers in journals which included the Entomologists' Gazette, Journal of Natural History and the Kew Bulletin, as well as innumerable notes in the Proceedings of the Birmingham Natural History Society, these Transactions and Natterjack. He also corresponded with mycologists around the world.

Reg's interests were not restricted to fungi and he was an accomplished entomologist, depositing no fewer than 2000 specimens of insects and spiders and 6000 records in the Castle Museum, Norwich. He recorded a fungus gnat new to England and collected two species of scuttlefly which await description as new to science. Reg had a particular fascination for parasitism in the natural world and became an expert on the fungi which parasitise insects and spiders.

Through his talks and field meetings (he led 46 for the Society) and above all by his painstaking response to any query, he inspired so many of us as we started on our study of the natural world. Reg was a Vice President of the Norfolk and Norwich Naturalists' Society although he never found it as congenial as the Birmingham society. He and Lil were proud to be referred to as the grandparents of the Norfolk Fungus Study Group which they helped to found in 2000 but the greatest tribute to Reg's memory will be the publication of a Norfolk mycota, now in preparation.

CLARK, M.C. (ed.). 1980. *A Fungus Flora of Warwickshire*. 272pp. British Mycological Society.

WATLING, R. 1998. The role of the amateur in mycology – what would we do without them! *Mycoscience* **39**:513-522.

OBITUARY: **Joyce Lambert 1916-2005**

Martin George

In 1952, JN Jenning's book, *The Origin of the Broads*, was published by the Royal Geographical Society. It was a memoir of the lakes in that area of Norfolk and Suffolk commonly called the Norfolk Broads, and, in it, the stratigrapher concluded that most, if not all, of those lakes had been formed by natural processes. But Jennings's apparently definitive interpretation was about to be spectacularly challenged.

His colleague, the botanist and fellow stratigrapher Joyce Lambert, who has died aged 88, had also been investigating the Bure and Yare valley Broads and Fens. And she demonstrated that the lakes of the Norfolk Broads had not been formed by nature but had been created by our ancestors.

Using a smaller peat borer than the one employed by Jennings, Lambert obtained a series of closely spaced cores around the broads, and discovered - to her amazement - that what had been thought to be natural lakes had near-perpendicular walls; moreover, their floors, three metres or so below the surface, were almost flat. Clearly they had originated as peat diggings, whose angular shape had been concealed by the overgrowth of vegetation once they had filled up with water.

In 1952, Joyce gave the Presidential Address to the Norfolk and Norwich Naturalists' Society and when editing that speech for publication , she inserted into it her new findings. These, together with a follow-up article in the Geographical Journal, caused a sensation. How could such extensive excavations have been dug by hand within areas of the flood plain now subject to regular inundation?

Backed by Cambridge University, a multidisciplinary team, including Joyce, was set up. Their findings were to be published in a second Royal Geographical Society memoir, *The Making of the Broads* (1960). Alongside their scientific analysis, the team noted that there was documentary evidence that substantial amounts of peat had been dug for fuel between the 12th and 14th centuries, in a region that was then one of the most economically successful and populous parts of the country.

The team also considered that the peat digging had probably been in progress for several centuries before then but was unable to find any direct evidence for this. However, they pointed out that those responsible for the diggings had thought it worthwhile to excavate to a depth of two to three metres to gain access to brushwood peat, because its calorific value was superior to that nearer the surface.

Research revealed that local parishes possessed 'turbary rights' to dig peat in their own areas which, Joyce established, coincided with the configurations of parish boundaries within the broads. It was also concluded that virtually all the excavations had been abandoned by the end of the 14th century as a result of their increased susceptibility to flooding. This was caused partly by a deterioration in the East Anglian climate and partly by a rise in the sea level. Where once there had been peat digging, there were now economically important fisheries.

Joyce was born in Herne Hill, south London, the only child of an estate agent father. Brought up in Brundall, she was educated at Norwich High School for Girls and graduated in botany from the University College of Wales, Aberystwyth, in 1939.

Three years later, after a spell as a schoolteacher in Norwich, she became a botany lecturer at London University's Westfield College (now incorporated in Queen Mary College). Prompted by the renowned Norfolk naturalist Ted Ellis and by AR Clapham, then of Oxford University, she began an ecological study of the fens bordering the River Yare in the Surlingham-Rockland area.

From 1946, she began publishing her findings in a series of papers. In 1948, she moved to Cambridge University and turned her attention to the fens located in the valley of another of the broadland, rivers, the Bure, working with Jennings.

In 1951, Jennings and Joyce published, in the Journal of Ecology, three classic papers relating the alluvial stratigraphy of the Bure valley to the vegetational succession occurring there. Then came Jennings's book and Joyce's discoveries.

Joyce had been appointed a lecturer in botany at Southampton University in 1950. There, she carried out a number of studies on the saltmarshes bordering Southampton Water, being particularly interested in the autecology of the invasive grass, *Spartina*. Later, she studied the plant communities of the New Forest, developing a computer-based methodology for their classification. She retired in 1979 and returned to live in the Yare valley house built by her grandfather in the early 1920s.

Physical incapacity meant that Joyce, a fervent Norwich City supporter, spent her last three years in a nursing home. But she retained her close interest in the broads, a region regarded today as the best example of a lowland wetland system in Britain. She was unmarried.

Shieldbug nymph feeds on Five-spotted Burnet

P. J. Heath

3 Lock Cottages, Lock Road, Honing, North Walsham, Norfolk NR28 9PJ

While most shieldbugs and their larvae feed on a variety of plants, a few are carnivorous. On the 28th June 2005 at East Ruston Common, I found a copulating pair of Five-spotted Burnets *Zygaena trifolii*, one of which was being attacked by a last instar nymph of the shieldbug, *Picromerus bidens*. The larva had pierced the thorax of the moth, which although still firmly attached to its mate seemed to be quite dead. While small caterpillars of moths, butterflies and sawflies are regular prey items of this shieldbug (Hawkins, 2003), it is perhaps unusual for one to tackle such a large and usually vigorous adult moth.

HAWKINS, R.D. 2003. *Shieldbugs of Surrey*. Surrey Wildlife Trust, Woking.

Notes

NORFOLK & NORWICH NATURALISTS' SOCIETY

The County's senior natural history society has as a principal aim the investigation and recording of Norfolk's wildlife and to this end publishes:

- An annual volume of *Transactions*, consisting of papers and notes on wildlife in the county.
- The *Norfolk Bird and Mammal Report* which contains systematic lists of observations on the county's birds and mammals, as well as relevant articles.
- *The Norfolk Natterjack*, a quarterly illustrated newsletter.

All of these publications are free to members, as are *Occasional Publications* on specific topics.

The Society also arranges lectures and field meetings which are planned to appeal to anyone interested in natural history. More specialist groups cover many aspects of the county's flora and fauna.

The subscription rate is £12 per year, which includes all members of a family living at the same address. Group affiliation is available at £15 per year.

Membership enquiries should be made to: Mr David Paull, 8,Lindford Drive, Eaton, Norwich NR4 6LT or DavidLPaull@aol.com

All other enquiries should be directed to the Secretary, Dr Rosemary Carpenter: 33 Low Street, Wicklewood, Wymondham, Norfolk NR18 9QG or rosemary@carpenter8932.freeserve.co.uk

Notes for Authors

Authors are requested to obtain a copy of Instructions for Authors from the Editor before submitting papers, which should be with the editor by February 1st of the year of publication. Wherever possible manuscripts should be accompanied with the text on computer disk.

The Editor will be pleased to discuss proposals for papers from anyone and will help novice authors with the production of material.

Editor: Mr Peter Lambley, The Cottage, Elsing Road, Lyng, Norfolk NR9 5RR or Plambley@aol.com

CONTENTS

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