

Breeding waders and their habitat in the New Forest, Hampshire, England

Colin R. Tubbs & Jennifer M. Tubbs

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The New Forest, in central southern England, is of international importance to nature conservation. It is a SPA and Ramsar site, the latter designation arising from the occurrence there of extensive peat bogs and wet heaths set in pristine catchments of lowland heath and woodland. Except for Lapwing *Vanellus vanellus*, breeding waders are strongly associated with the bogs and wet heaths. In 1994 breeding populations were censused in a random sample (33%) of the 93 x 1 km² containing 15 ha or more of bog and wet heath. By extrapolation we estimated that these 93 km² (which contained most of the wetland area of the Forest) held 84-87 pairs of Lapwing, 136 pairs of Snipe *Gallinago gallinago*, 54-57 pairs of Redshank *Tringa totanus* and 132 pairs of Curlew *Numenius arquata*. Total populations will be somewhat larger than this because 1 km² with less than 15 ha of bog and wet heath were not sampled. In particular, Lapwing numbers will be much larger, a less rigorous survey of 1994 suggesting about 190 pairs. In common with other elements of the Forest's fauna, the waders appear dependant on grazing, which opens up and diversifies the structure and composition of the otherwise tall, dense dwarf shrub and *Molinia* dominant vegetation. Many Lapwing are associated with recently burnt heathland and are thus dependant on the regime of controlled heath burning, carried out mainly for the benefit of the commoners' animals. Comparison with other lowland heathland in southern England confirms that in the absence of pastoralism, breeding wader populations are small.

C.R. Tubbs & J.M. Tubbs, 24 Queens Road, Lyndhurst, Hampshire SO43 7BR, U.K.

INTRODUCTION

The New Forest lies on Tertiary sands and clays in a chalk syncline known as the Hampshire Basin. Geomorphologically it comprises a series of eroded Pleistocene terraces arranged in diminishing height from north to south. In the north erosion has dissected the plateau into parallel ridges separated by wide valleys draining east to the River Avon. In the south and east, at lower elevations, a complex history of denudation and river captures has left wider basins with extensive bogs separated by low terraces and draining southward to The Solent.

The New Forest is of international importance to nature conservation and biological science. Most of it (the Crown lands) are managed by the Forestry Commission, though they have only limited silvicultural functions there. It is classified as a Special Protection Area under the EC Directive on the Conservation of Wild Birds, and listed as a wetland of international importance under the international 'Ramsar' Convention on the conservation of wetlands of international importance because of its peatlands and their pristine catchments. It is also a proposed EC Special Area of Conservation. Under domestic legislation it receives a degree of protection as a Site of Special Scientific Interest. Its unenclosed common lands (19,771 ha) comprise a complex ecosystem which is developing continuously, primarily under the influence of a pastoral economy based on the exercise of common rights. The composition and distribution of plant communities and the morphology of their component

species are strongly influenced by the grazing of cattle, ponies and also deer. The Forest includes the largest tract of 'unsown' vegetation in lowland Britain mainly comprising three habitats now rare and fragmented in western Europe - lowland heath (12,000 ha), valley bog (1,492 ha), and ancient wood pasture (5,000 ha). Nowhere else do these three habitats now occur on so large a scale nor as components of a single ecosystem (Tubbs 1986).

About 70% of the lowland heath element comprises humid and wet heath vegetation on peaty, only slowly permeable soils on parent rocks with a high clay content and high groundwater levels. The vegetation of the wet heaths is characterised by Deer Grass *Trichophorum cespitosum*, Heath Rush *Juncus squarrosus* and the mosses *Sphagnum tenellum* and *S. compactum* on shallow peat, whilst the humid heath mainly comprises Heather *Calluna vulgaris*, Cross-leaved Heath *Erica tetralix* and Purple Moor Grass *Molinia caerulea* usually on mineral soils saturated by winter precipitation.

Estimates of the numbers of waders breeding in the New Forest, made between 1960 and 1981, were summarised by Tubbs (1986). Although based on incomplete and generally superficial surveys, they suggested that the Forest held breeding populations of Lapwing *Vanellus vanellus*, Redshank *Tringa totanus*, Curlew *Numenius arquata* and Snipe *Gallinago gallinago* comparable in size to other aggregations of breeding waders in lowland England, most of which occur on valley flood plains and

other areas of wet meadowland. Curlew appear to have colonised the New Forest mainly since the 1930s (Cohen 1963). Redshank, Curlew and Snipe were strongly associated with bogs and wet heaths, to which most pairs took their young on hatching. Lapwing were more strongly associated with dwarf shrub heathland suppressed by grazing or recent burning, or both. Until late May, invertebrate biomass available to Curlew and Redshank on the Forest may be low and there is a constant interchange of individuals between Forest breeding sites and nearby coastal mudflats.

In 1993, 81 km² (55%) of the Forest heathlands and bogs were censused for breeding waders by ten observers, each of whom was asked to visit a specified area on three occasions during April-June. Although it proved impossible to achieve a standard method among participants, the survey yielded improved population estimates.

In 1994, we carried out a survey of breeding waders in the New Forest on behalf of the Royal Society for the Protection of Birds. This applied a standard, repeatable, census method to a random sample of the potential habitat and sought to amplify information about the habitats of breeding waders in relation to the Forest's pastoral land uses and management. Results of this are reported here and comparison made with the 1993 survey.

THE 1994 SURVEY: METHODS & FIELD CONDITIONS

Using a vegetation survey of the Forest carried out by the Nature Conservancy Council during 1986-88 (Westerhoff 1992), a random sample of 31 x 1 km² was selected from all 1 x 1 km² (n=93) with at least 15 ha of valley bog and wet heath vegetation. Survey methods followed those of O'Brien & Smith (1992). The selected 1 km² were visited three times, during 10-30 April, 1-21 May, and between 22 May and 22 June. At least two weeks separated successive visits to the same 1 km². Visits commenced at or shortly after dawn and continued until we were satisfied that surveys were as complete as practically possible, but in any event by 1200 hrs. The intention was to approach every part of each 1 km² to within 100 m, following a similar route on each visit, but in practice it was not possible to adhere consistently to this because the axis of most bogs were impassable and the numerous streams were mostly too deep to ford for at least part of the survey period. Locations in which birds were recorded were identified on 1:10,000 scale OS maps, and habitat and other relevant information recorded. The order in which each 1 km² was walked was varied between visits.

The method used to derive breeding wader populations within the 31 randomly selected 1 km² also followed that of O'Brien & Smith (1992) and is summarised below:

Species	Date collected	Method of estimation
Lapwing	Total birds seen in each km ² on each visit	Halve highest count from visits 1 and 2
Redshank	Total birds seen in each km ² on each visit	Add total recorded on visits 1 & 2 and divide by two
Snipe	Total drumming/chipping birds in each km ² on each visit	Maximum number of drumming/chipping birds on any visit so long as there were drumming/chipping birds in May
Curlew	Total pairs in each km ² on each visit, where 'pairs' = paired individuals, displaying birds, nests or broods or other single birds attached to a breeding area	Maximum number of pairs recorded during the three visits

Survey conditions in spring 1994 were difficult. April-June 1994 was cool and wet and followed an exceptionally wet winter, in turn the culmination of two years of higher than average rainfall in central southern England. The Forest resembled a giant sponge. Stream discharges were high, water storage in bogs and wet heaths was maximal, pools and ponds, permanent and ephemeral, were full. Bogs, wet heaths and the larger streams were impassable or negotiable only slowly. Only after about 20 April was there noticeable drying of the more permeable soils and a general lowering of water levels in pools, but bogs and wet heaths remained at or near storage capacity and there were strong stream discharges throughout May. Discharges rose immediately and dramatically in response to even light rain, and pools reformed readily in depressions on level surfaces. Sustained drying of the Forest only began after completion of the wader survey in late June. However, we were confident that few waders were missed except perhaps Snipe, but we had no means of knowing if the numbers of birds present were affected by the conditions.

ESTIMATES OF BREEDING WADER POPULATIONS

Population estimates of the numbers of waders breeding in the 31 randomly selected 1 km² surveyed in 1994 are shown in Table 1. Table 2 gives the results of extrapolating the estimates from the random sample to the 93 x 1 km squares in the New Forest as a whole which have 15 ha or more bog and/or wet heath vegetation. Table 3 shows the number of squares visited in which each species of wader was recorded, and hence provides a measure of wader distribution. Waders were registered in 28 of the 31 x 1 km² (90%) on one or more of the three visits. We failed to register waders in 11 x 1 km² on at least one of the three visits.

Table 1. Population estimates for breeding waders in 31 randomly selected 1 km squares in the New Forest in 1994.

Species	Lapwing	Snipe	Redshank	Curlew
Pairs	28-29	52	18-19	44

Table 2. Population estimates of breeding wader in 93 x 1 km² with 15 ha or more of wet heath and/or bog in the New Forest, extrapolated from a random sample of 31 x 1 km² (33%).

Species	Lapwing	Snipe	Redshank	Curlew
Pairs	84-87	156	54-57	132

Table 3. Numbers of 1 km squares in which each species of wader was recorded during three visits to each of 31 randomly selected 1 km squares in The New Forest, April-June 1994.

	Ringed Plover	Lapwing	Snipe	Curlew	Redshank
Visit 1	1	6	12	18	7
Visit 2	1	15	13	20	7
Visit 3	1	14	19	18	7

Snipe posed special census problems. Drumming and chipping was heard only intermittently and often only briefly. Chipping was often subdued. The low level of obvious breeding activity may have related to the wet, windy, weather or to low Snipe density in the extensive tracts of apparently suitable habitat, or to both these factors.

The populations derived by extrapolation from the random sample will be less than the total breeding populations of the New Forest because the random sample was derived only from those km² with 15 ha or more of bog and, or, wet heath. It was not possible in the time available to census a random sample of those 1 km² with less than 15 ha of wet heath and bog. The numbers of Lapwing in Tables 1 and 2 will, in particular, under-estimate the Forest population.

Table 4 gives the numbers of waders found during the 1993 survey and extrapolates from this to the total area of heathland and bog in the Forest. Though the 1994 estimates are also shown, it should be emphasised that no strict comparison is possible because census areas were chosen on different criteria. The 1993 survey probably gave the better estimate of the Lapwing population because comparatively more heathland was included in the sample than in 1994. All who participated in the 1993 survey agreed that Snipe were likely to have been grossly under-estimated because few early morning visits were made. The 1994 Curlew estimate is closer to an estimate of 120 pairs for the early 1980s (Tubbs 1986) than it is to that for 1993.

Table 4. Summary of results from a survey of 81 km² (55%) of the unenclosed heathlands and bogs of the New Forest in 1993 compared with 1994 population estimates.

Species	Estimated no. pairs in study area	Extrapolated New Forest population	Estimated minimum New Forest population
	1993	1993	1994
Lapwing	104	190	84-87
Curlew	53	96	132
Snipe	48	87	156
Redshank	38	69	54-57

BREEDING HABITAT

Ringed Plover

In 1994 the random sample included one to two pairs of Ringed Plover, located on an artefact derived from a Second World War bombing range. Here, a 2.8 ha area of concrete had been removed in 1991 to leave a muddy, rubble strewn surface with numerous small pools which had dried out by the third visit. A further five pairs nested at a second site outside the random sample on bare terrace gravel left from a 1990 intensive wildfire. Former wartime airfield runways have also been used by the species in recent years.

Snipe

All registrations of Snipe in 1994 were for bogs and their fringing zones of wet heath. However, of 102 registrations of individual bird, at least 80 occurred where the tendency to *Molinia* dominance had been checked and the structure of the vegetation opened up by grazing. Of the remaining 22, only four could certainly be assigned to bogs or parts of bogs dominated by dense *Molinia*.

Lapwing

The habitats in which Lapwings were found in 1994 are given in Table 5. Nearly half the number of individuals registered on each of the three visits were found on wet, humid or dry heath which had been burnt during the previous 1-6 years (47% Visit 1; 59% Visit 2; 59% Visit 3). Much smaller proportions were recorded on bogs and neutral grassland (lawns) mainly on valley bottom alluvium. A single pair bred on the rubble strewn area favoured by the Ringed Plover. The relatively large number recorded for reseeded areas referred to a single such area which was in the mid-stage of reversion to dry heath, though nonetheless it was heavily grazed. All localities exhibited evidence of intensive grazing. The vegetation of the burnt sites was in all cases suppressed by grazing; the lawns were very closely cropped; and the bog registrations were in localities where the plant community was maintained in an open condition by grazing.

In 1993, habitat was recorded for 54 of the 104 pairs of Lapwing reported. Of these, 20 were in places where ericoid heath was heavily cropped by animals; 14 were on recently burnt sites; eight were on or at the margins of bogs; and 12 were on lawns. This probably reflects habitat choice more accurately than the 1994 survey. However, it should be emphasised that categories are not always easy to define. For example, lawn often grades to heavily cropped heath or bog, and cropped heathland is often in the process of conversion to acid grassland or sedge dominant communities.

Table 5. Habitats in which Lapwings were registered during three visits to 31 randomly selected 1 km squares in the New Forest during April-June 1994.

Habitat	Numbers of individual Lapwings		
	Visit 1	Visit 2	Visit 3
Meadow*			4
Bog	2	1	5
Wet heath (burnt)			4
Dry heath (burnt)	1	6	16
Humid heath (burnt)	18	20	13
Lawn	5	5	2
Reseeded area	14	12	8
Bare surface + rubble			2
Totals	40	44	54

* enclosed meadow adjoining unenclosed Forest

Table 6. Habitats in which Curlew were registered during three visits to 31 randomly selected 1 km squares in the New Forest during April-June 1994.

Habitat	Numbers of pairs		
	Visit 1	Visit 2	Visit 3
Bog/wet heath	9	13	17 (inc 12 + broods)
Bog/wet heath & dry/humid heath	17	19	3
Dry/humid heath	4	2	2
Totals	30	34	22

Curlew

In 1994, Curlew were often hard to assign to particular habitats because pairs or individuals frequently ranged over large areas. After initial experience we concluded that the most realistic allocation was to bog/wet heath, a combination of bog/wet heath and humid/dry heath, and to humid/dry heath alone. The results for each of the three visits are given in Table 6. They serve to emphasise the link with high groundwater levels, while the increase over the three visits in the numbers recorded in the wetter sites probably reflects a movement to them of pairs with dependant broods. All 17 of the bog/wet heath registrations on the third visit referred to localities where the vegetation was strongly modified by intensive grazing. In one such locality during the 1993 survey, we found no less than five pairs with broods within a 3 ha area of modified bog.

Redshank

All Redshank were assigned to bog/wet heath, but this does not adequately describe Redshank breeding habitat in the New Forest. All Redshank recorded were in localities where the structure of the vegetation had been severely modified by grazing to produce a small scale mosaic of peaty, sedge-dominant plant communities, patches of open *Molinia* tussocks, shallow pools and small patches of fringing wet neutral grassland, often with patches of *Myrica gale* and surfaces marked by a micro-topography of hummocks known to be derived from *Molinia* tussocks.

DISCUSSION

The breeding populations of waders in the New Forest are important in the context of lowland England, where inland aggregations of comparable size and variety are now few. Meadow populations, formerly widespread, have declined mainly as a result of drainage and intensified agriculture (Smith 1983; O'Brien & Smith 1992). In contrast, the New Forest offers the prospect of relative ecological stability, provided that the existing pastoral land use, on which the birds indirectly depend, can be maintained. For the foreseeable future, pastoralism in the Forest seems secure, but there are underlying stresses in the socio-economic system which may pose threats in the longer term (Tubbs 1994). Paradoxically, wader habitat is to some extent threatened by pastoralism in that the grazing-modified localities in bogs favoured by waders are precisely those which draw demands from the commoners for drainage 'improvements', because they superficially appear to be invaded by bog rather than in the process of being modified from it. It remains necessary to resist such demands, which plainly conflict with the Forest's international conservation status.

The unenclosed common lands of the New Forest (which includes all the wader breeding habitat) are grazed by the ponies and cattle of the New Forest commoners. In the ten years 1984-93, annual means of 3,249 ponies, 1,850 cattle (excluding calves) and 85 donkeys were depastured (the act of a commoner releasing animals onto common land) by about 400 commoners. Numbers are somewhat lower in winter. Both numbers of commoners and numbers of animals increased somewhat during the period. Mean summer stock density was about 4 ha/animal, or a combination of 6 ha/pony and 10.7 ha/cow. These are high stocking densities for year-round grazing of semi-natural vegetation.

Ponies have a relatively greater impact on the vegetation because they are non-ruminants dependant on high throughput of poorly digested material and eat a wider range of plant species than cattle including much woody vegetation. Both ponies and cattle exploit different food sources sequentially through the year, depending on nutritive value, availability and above-ground production (Tubbs 1986; Pratt *et al.* 1986; Putman *et al.* 1987).

Bogs are of special importance to grazing animals and are exploited particularly intensively in the spring, when the first regrowth of vegetation on the Forest occurs there, and in dry summers, when many other plant communities are prone to desiccation. Grazing considerably modifies the bog plant communities by suppressing potentially dominant purple moor grass and producing a variety of low sedge and *Sphagnum* dominant vegetation with abundant patches and runnels of open water created by trampling. By thus modifying the bog structure, intensive grazing has been shown to increase the number of wetland plant species present (Clarke 1988) and to create habitats for a wide range of wetland invertebrates which would otherwise be absent or rare (Tubbs 1986). Similarly, we believe it is doubtful if the populations of Snipe, Redshank and Curlew would persist in the long term in the absence of intensive grazing.

Breeding Lapwing are similarly linked to pastoralism in the Forest. They occur either where the potentially dominant ericaceae and *Molinia* are suppressed by grazing or where controlled heath burning has taken place, the primary purpose of which is to provide a fresh flush of vegetation for commoners' animals. About 500 ha are burnt annually in March by the Forestry Commission, mainly in a large number of small areas, yielding an ample area of potential Lapwing breeding habitat, only a small (but unmeasured) proportion of which is occupied by the relatively small breeding population.

Elsewhere in central southern England, areas of lowland heath and bog ecologically comparable with that of the New Forest survive in the Hampshire Basin in Dorset, (c. 8,000 ha,) where the most extensive continuous areas adjoin Poole Harbour; in the Thames Basin in north-east Hampshire and Surrey (c. 5,000 ha); and in the Sussex Weald (5,000-6,000 ha), notably in Ashdown Forest (Tubbs 1986; Surrey County Council 1988; Webb 1990; Farrell 1990). In all these areas, the pastoral economies associated with the heaths decayed in the late 19th and early 20th centuries and, except where there has been a recent resumption of grazing as part of conservation and restoration initiatives, the heaths have been ungrazed for half a century or more. Recent research in Dorset has shown that a consequence there has been the gross impoverishment of the flora as the vegetation structure has become simplified (Byfield & Pearman 1994). There and elsewhere, the heathlands now lack the variety of close-cropped plant communities characteristic of the New Forest, and tend to be dominated by ericoid dwarf shrubs, *Molinia*, and in Surrey, Wavy Hair Grass *Deschampsia flexuosa*, whilst invasion by Birch *Betula* spp. and Scots Pine *Pinus sylvestris* and other trees is widespread.

Not surprisingly, breeding waders are uncommon. Reference to the relevant County Bird Reports show that the heaths support no more than a very low density of Curlew, and occasional pairs of Snipe and Redshank. The Thames Basin heaths, for example, apparently had only a single pair of Curlew in 1994, following a decline from five to six pairs during the past decade. Many of the heaths, however, have recently become the subject of various conservation initiatives which seek to restore pastoralism and retrieve heathland and bog from

succession to woodland. Experience in the New Forest suggests that sustained grazing by high densities of stock will be necessary to produce conditions favourable to breeding waders and significantly enhance faunal and floristic diversity more generally.

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