WOLD ECOLOGY

NORTH YORK MOORS

NATIONAL PARK

BREEDING WADER STUDY

FINAL REPORT 2024

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Notes.	**This report may contain sensitive information on protected species. Therefore, caution should be taken on release to third parties.**	

EXECUTIVE SUMMARY

Between 1996 and 2024 six large scale breeding wader surveys have been carried out on open moorland within the North York Moors National Park (NYMNP). All six surveys used the same generic methodology adapted from Brown and Shepherd (1993) as described within *Bird Monitoring Methods*, a manual of techniques for key UK species *(*Gilbert *et.al. RSPB 1998*). The principal aim of this method was the census of all upland breeding waders. The technique involved the random selection of 92 x 1 km squares of at least 75% open moorland. Each square was surveyed as a constant effort and visited twice.

Four species of wading bird were surveyed: northern lapwing *Vanellus vanellus*, European golden plover *Pluvialis apricaria*, common snipe *Gallinago gallinago* and Eurasian curlew *Numenius arquatam*. Records of common redshank *Tringa totanus* (which historically bred in small numbers) were also sought but no birds were found in 2024. Following data analysis, the golden plover, lapwing and curlew breeding populations were all found to have undergone a statistically significant decline with snipe the only species rising slightly (see 2.2.2 for caveat). Over the six surveys since 1996 golden plovers have declined the most at 39% decline although 57% of survey squares still held at least one breeding pair of golden plovers in 2024. Lapwings have declined in each survey since 2000. The curlew 2024 figures were the lowest figures since the surveys began with less than 200 breeding pairs.

Regional differences across the National Park were detected with the highest population of waders in the central region, which was the same in previous survey years. Year on year increases in the west and east since 1996 dropped in both regions in 2019, the decline continued in the west in 2024 but rose slightly again in the east. The northern region declined in 2024 after an increase in 2014. Peatland restoration was found to have provided habitat resilience over the four survey years: 2008, 2014, 2019 and 2024. Using the survey results, regional examples of restoration projects and habitat suitability research are described. Future land management practices are recommended in order to maximise conditions for waders to attain breeding condition in early spring and maintain condition throughout their breeding cycle. We also stress the importance of monitoring the populations using targeted surveys and productivity studies in the years between the full surveys to evaluate the success of habitat management and peat restoration works. Meadow pipit productivity fell sharply in 2024. In 2019 61% of visit two results returned higher numbers than visit one, in 2024 this fell to only 45%.

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1.0 INTRODUCTION

1.1 The North York Moors National Park (NYMNP) is in the North-East of England and covers approximately 1200 square miles, including an area of almost 150,000 hectares of open moorland. Topography is that of mainly gentle to moderate slopes of heather moorland rising to 434 metres above sea level. There are some areas of steep-sided slopes and crags. The main altitudinal range lies between 50 and 200 metres above sea level, but some forested regions can rise to 300 metres above sea level. Land use is split into 60,000 hectares of farmland, 50,000 hectares of heather moorland and 32,000 hectares of forest. This large-scale mosaic provides diverse habitats for wildlife (Rona Charles *pers. comm.*).

1.2 During 1997 and 1998 a comprehensive survey of upland vegetation was undertaken throughout all open moorland within the NYMNP. As a result, the total area of open moorland was estimated to be 460 km^2 (Jerram *et. al.* 1998, as cited in Shepherd 2000).

1.3 Over the breeding season years 1996, 2000, 2008, 2014, 2019 and 2024, six large scale breeding wader surveys were commissioned by the North York Moors National Park Authority and carried out on open moorland within the National Park.

1.4 The first breeding wader survey in 1996 was conducted as part of the monitoring requirements of the Moorland Regeneration Programme. The survey involved the random selection and field survey of 92 x 1km squares of at least 75% open moorland. The following surveys in 2000, 2014, 2019 and 2024 also covered 92 x 1km squares, while the 2008 survey covered 84 x 1km squares.

1.5 The 1996 baseline survey showed that the North York Moors National Park held between 2.3% and 3.1% of the British breeding population of golden plover and between 0.3% and 0.6% of the European breeding population. Both estimates were, at the time, nationally and internationally important. Numbers of breeding pairs of lapwings were found to be between 0.2% and 0.4% of the British population.

1.6 The survey method was found not to be suitable for snipe, largely due to their crepuscular display period, and only 244 (revised) breeding pairs were found. Estimated numbers of curlew were found to be between 0.7% and 1.4% of the British breeding population and nationally significant (Charlton and Archer 1996).

1.7 In 2000 the second survey of breeding waders was carried out as part of the continuation of the Moorland Regeneration Programme. A comparison of the two surveys revealed populations of golden plover and snipe to be stable, whilst curlew and lapwing showed a significant increase (Shepherd 2000). Whilst this increase may have been a genuine rise in numbers of breeding curlew, recent telemetry studies have shown the presence of large numbers of non-breeding curlews in the breeding areas (Bowgen 2022).

1.8 In 2008, because of ongoing national conservation concern for the four wader species involved, they were included in the Local Biodiversity Action Plan (LBAP) of the NYMNP. Emphasis was placed on species and habitats that are internationally important or characteristic of local areas and those that have declined significantly over recent decades (NYMNPA 2008). Two of the plan's targets were to maintain and enhance the current populations of waders within the National Park (NYMNPA 2008). Monitoring of this population therefore became essential. One of the main prescribed actions of the Species Plan was to undertake a wader survey every five years, hence the 2014, 2019 and 2024 surveys.

1.9 These surveys, their results and evaluation therefore satisfy several project and statutory requirements –

- In 1996 the surveys produced a baseline estimate of breeding waders as part of the Moorland Regeneration Programme
- Future trends based on the 1996 data could then be used to indicate the health of the upland environment
- The surveys currently assist and comply with monitoring requirements required by Natural England in order to inform the Favourable Conservation Status of wader species and the SSSI feature assessment.

1.10 In 2024 Wold Ecology R.B Ltd was again commissioned to produce a report based on the findings of the five surveys with the following brief:

- Describe the results of the 2024 survey.
- Provide a comparative analysis of all six survey years.
- An evaluation of trends within the data both locally, regionally and nationally.
- Discussion of the findings with respect to local land management.
- How the results can be used to inform land use management and policy change.

- Further research and survey recommendations.

2.0 SURVEY METHODS

2.1 Field Survey Methodology

2.1.1 The method used in each of the six survey years was the generic survey methodology adapted from Brown & Shepherd (1993) as described within *Bird Monitoring Methods*, a manual of techniques for key UK species *(*Gilbert *et.al.* 1998*)*. The method was principally aimed at developing a census of all upland breeding waders including golden plover, snipe, lapwing, curlew and redshank. The field methods are aimed at collecting the following data:

- Estimated number of breeding pairs of each species
- Final visit maps indicating territories and showing all registrations and areas covered.

2.1.2 The standard method requires a minimum of two visits to each survey plot during early April – late June. The first visit undertaken between early April and mid-May and the second visit from mid-May to late June. The first visit is best at detecting species such as lapwing and curlew which breed relatively early and the second for species like golden plover which can breed later (Charlton & Archer 1996).

2.1.3 Within the standard method visits are carried out at any time between 0830 and 1800 BST depending on weather constraints. Survey work was not undertaken in mist, fog or other factors associated with poor visibility, continuous or heavy/medium precipitation and/or wind speeds greater than Beaufort Force five (see attached sheet for detailed definitions).

2.1.4 Within the pre-defined survey area, the following topographical and habitat areas were excluded from the survey:

- Human habitation

- Woodland/forest areas either natural or planted that have reached the thicket stage or older.
- Enclosed farmland (in bye pasture)

2.1.5 The standard survey method is based on a timed total area search, with a constant search effort. The standard method times are 25-30 minutes (20-25 if just recording waders) for each 500 x 500m quadrat of open land and 0.8-1.0 minutes for each Ha of enclosed fields. In practice the time taken for each plot was also determined by access, health and safety precautions and habitat. Care was taken to survey all areas equally and where possible the second visit was walked in the opposite direction to the first visit (Shepherd 2000).

2.1.6 Scanning with binoculars or telescopes was used to detect birds at approximate 100m intervals and close attention was paid for displaying birds their behaviour and their calls and songs. As each individual or pair was encountered, this was related to any previous registration to check for double counting.

2.1.7 On occasions nests may be found, but the main intention of the survey was for observers to focus their attention on adult birds and their behaviour which could indicate breeding or otherwise.

2.1.8 On completion of the fieldwork visits, all registrations were compiled onto individual master maps, with each visit registration given code A for the first visit and B for the second.

2.1.9 Cluster analysis was used to determine territory occupancy, and furthermore, birds can be identified as breeding if -

- They are recorded as displaying and/or singing
- Active nests, eggs or young are located
- Nest building activity is observed
- Adults engage in repeated alarm calling
- Distraction displays are recorded
- Territorial disputes are observed.

2.1.10 On occasions where several breeding individual birds were seen in one area, and it had been difficult to estimate the numbers of breeding pairs then individuals were deemed to represent different pairs only if the distance between them was greater than 500m. This distance was chosen arbitrarily and reflects roughly the distance over which a breeding bird may travel during a single census visit (Shepherd 2000).

2.1.11 Pairs of breeding birds were only considered to be separate from each other if they were greater than 1000m apart. This distance again was chosen arbitrarily to roughly reflect the distance birds may move between survey visits. Therefore, the identified locations of breeding waders in fact represented centres of breeding activity and not necessarily locations of nest sites or breeding territories (Shepherd 2000).

2.2 Constraints

2.2.1 Whilst every effort was made to cover each section of the squares some contained some steep and difficult terrain. Any areas noted as potentially unsafe were surveyed from the nearest safe point. In practice there were very few areas of this nature.

2.2.2 On four dates (covering only six out of the 184 squares), the 3rd April, 22nd April, 24th April and the 16th June, rain adversely affected the surveyor's work. On these dates where surveyors noted 'heavy rain' or 'thunderstorms' or 'heavy showers' in the field notes the surveys were stopped temporarily and then restarted when the rain had stopped. On a small number of additional dates either light rain or drizzle occurred briefly allowing the surveys to continue in better conditions. These results show that the great majority of surveys were carried out in suitable conditions for detecting breeding waders. On the very small number of dates where rain did affect the surveys, sufficient effort was made to ensure these conditions did not affect the integrity of the results.

2.2.3 The survey method was unsuitable for accurate counts of snipe due to the timing of their peak display period being at dawn and/or at dusk. Counts and estimates made for snipe in this report are therefore made with the caveat they are likely to be higher than those figures quoted.

2.3 Estimation of Wader Populations

2.3.1 The total area of open moorland was estimated to be 460 km^2 (Jerram et al 1998). The minimum numbers of breeding waders within this area were estimated by extrapolation from the overall densities found in the 92, 1km squares surveyed. The actual total area of open moorland within these survey sites was 77.36km^2 (Shepherd 2000).

3.0 SPECIES DESCRIPTIONS AND STATUS

3.1 The following systematic species descriptions describe general habitat requirements and conservation status for each key species. Results of the 2019 survey are described in this section to produce a base line for comparison with the 2024 results which are described in section 4 page 14. This section includes species which are either notified Schedule 1 species, Wildlife and Countryside Act 1981 (as amended), breeding Red or Amber listed species (high conservation concern) as described in The Population Status of Birds in the UK BOCC5 (*Birds of Conservation Concern 5*: updated 2021), NYMNP SPA qualifying species EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area (SPA) or UK/LBAP Biodiversity Action Plan priority species (UKBAP species).

The British Ornithological Union (BOU) now uses the International Ornithological Council (IOC) nomenclature in the updated *IOC World Bird List 2024*. Gill F, D & P. Ramussen (Eds). The continued usage of British Bird names is explained in the following citation. The British List: A Checklist of Birds of Britain (10th Edition) 2022. Published in *Ibis 164:860-910.*

3.2 European Golden Plover *Pluvialis apricaria*

National and Regional Context; *North York Moors Special Protection Area (SPA) qualifying species. Moved from Amber to Green List in BOCC4 and retained there in BOCC5.*

3.2.1 Golden plovers breed in a wide range of upland habitats including wet heaths, blanket bogs, acidic grasslands and other sub-montane habitats. In the North of England these areas often overlap with areas that are managed as grouse moors. It was described as a common species on the North York Moors in the 19th century (Holloway 1996)

3.2.2 The nest site is a shallow scrape on the ground in short vegetation (<15cm) such as on moorland burns, bare ground, short heath or cotton grass tussocks and is often well hidden by surrounding moorland vegetation. Eggs are generally laid from the end of March in Northern England through to mid-May with one clutch of four eggs per year, but this clutch size can vary between two and five.

3.2.3 Food consists of beetles, earthworms and other invertebrates and some plant material, with cranefly larvae being of particular importance. Golden plovers in summer can range between two and seven kilometres from the nest site. Breeding sites are vacated from early July with the birds moving south and east for winter when they are more attracted to winter cereals, stubbles, close-grazed pastures and other lowland agricultural habitats.

3.2.4 The survey of 2019 showed that golden plovers within the National Park had a breeding density of 1.73 pairs/km^2. This density was substantially higher than that of 2008 which was 1.46 pairs/km^2 but lower than 2014. The extrapolated 2019 population for the whole moorland area was 795 pairs (compared to 938 pairs in 2014). The 2019 number represented approximately 2.47% of the estimated UK breeding population of 38,000 pairs (Musgrove et al, 2013). Although the current estimated UK population is down to 33,000 pairs (BTO 2024). The estimated 2019 population was approximately 0.17% of the European breeding population estimated as 460,000 pairs (avibirds.com).

3.2.5 Golden plover is noted in the NYMNP SSSI citation as part of the important bird assemblage (English Nature 2000).

3.3 Northern Lapwing *Vanellus vanellus*

National and Regional Context; *Red List Species BOCC5, UK and regional long-term breeding population decline, BBS 2023 data which shows a continued regional decline in Yorkshire.*

3.3.1 Lapwings breed in areas with a mosaic of habitats surrounding the nest site, which is a scrape on the ground sometimes lined with plant vegetation, usually situated on wet grassland; in upland habitats this includes including heath and bog. Previous research has found that the birds prefer to nest in fields that are grazed throughout the breeding season where sward length is controlled to provide an abundance of invertebrates for

the chicks. Breeding populations are often found in small colonies to aid in the defence of chicks and nests from predators.

3.3.2 Food consists mainly of earthworms, insects, beetles and other invertebrates including some plant species (Eglington 2009). The eggs are laid from late March to early May with a usual clutch size of four, but this can vary from two to five. The birds are single-brooded.

3.3.3 In winter lapwing populations tend to group together in lowland areas, sometimes around estuaries, and in areas with short permanent grassland.

3.3.4 The survey of 2019 showed that lapwings within the National Park had a breeding density of 1.23 pairs/km^2. The extrapolated population of lapwings across the entire moorland area was 566 prs in 2019 (598 pairs in 2014) which is approximately 0.40% of the UK breeding population estimate of 140,000 pairs (Musgrove et al, 2013). This is approximately 0.03% of the European breeding population estimated at 1,590,000 pairs (Birdlife, 2015). Since then, however the current Lapwing UK population estimate has dropped to 98,000 pairs (BTO 2024).

3.3.5 Because of local and national declines, lapwing has Red Status (BoCC5) and is noted in the NYMNP SSSI citation as part of the important bird assemblage (English Nature 2000).

3.4 Common Snipe *Gallinago gallinago*

National and Regional Context; *Amber list species BOCC5, current BBS (2023) data shows a continuing regional population increase against a backdrop of national decline since 1994.*

3.4.1 Snipe are relatively widespread throughout Northern England, Wales, Scotland and Ireland, and are often found breeding on rough marshy pastures and moorland bogs with frequent clumps or patches of herbage or shrub cover affording good visibility of approaching danger. These areas are often lowland areas with fen, wet pastures and damp grassland (Sharrock 2010). These areas provide a rich source of food including earthworms and other invertebrates (Hoodless *et.al.* 2007).

3.4.2 Snipe nest in hummocks and tussocks in grass, heather and rushes lined with vegetation. Eggs are laid from early March to May with a usual clutch size of four, but this can vary from two to five.

3.4.3 The survey of 2019 showed that snipe within the National Park had a breeding density of 0.51 pairs/km^2. The extrapolated population of snipe for the whole moorland area was 216 pairs (245 prs in 2014) (see 2.2.2 page 8). At the time this represented 0.27% of the UK breeding population estimate of 80,000 pairs (RSPB) and was approximately 0.02% of the European breeding population estimate of 930,000 pairs (avibirds.com). The current updated population estimate for the UK population is 67,000 pairs (BTO 2024).

3.4.4 Snipe is protected under Annex 2.2 and 3.2 of the EC Birds Directive. The UK population has undergone moderate declines overall in the past twenty-five years, with particularly steep declines in lowland wet grassland. As a result, it is placed on the Amber List of conservation concern (BOCC5) and is noted in the NYMNP SSSI citation as part of the important bird assemblage (English Nature 2000).

3.5 Eurasian Curlew *Numenius arquata*

National and Regional Context; *Red List Species BOCC5 and UK BAP species. Uncommon breeder, the 2023 BBS report shows a small increase in the number of Curlews in Yorkshire. This against the backdrop of some of the biggest declines of any UK breeding species with the UK population nearly halved since 1995 (BTO BBS Report 2023) The national population is currently estimated at 58,500 prs (Curlew Recovery Project) or 59,000 prs (Game & Wildlife Conservation Trust)*

3.5.1 Curlews breeds in a variety of habitats including upland moors, peat bogs, swampy and dry heathlands and damp meadows and grasslands. In common with other wader species in such habitats, the next on the ground, often on a tussock for protection. Eggs are laid between late April and late June. The species is single brooded with a usual clutch of four, but this can vary between two and five.

3.5.2 The diet of curlews in summer is primarily beetles and earthworms but other terrestrial invertebrates are also important. In winter, the population in the UK comprises both British and Scandinavian breeding birds with a majority wintering on estuaries and

coastal areas (Musgrove *et.al.* 2011) with some birds moving as far as France or Spain. Birds reared in Yorkshire regularly winter in Ireland and Southwest England. Locally large numbers, more than 1000+, curlew winter in the North Yorkshire lowlands between Ripon and Catterick.

3.5.3 The 2019 survey showed that the breeding density of curlew within the North York Moors National Park was 2.95 prs/km2 (2014 fig. 3.07 pairs/km$^{2)}$. This is like previous densities found on open moorland in the UK (Marchant, 2008). The extrapolated population for Curlew across the whole moorland area was 1357 pairs (1412 in 2014). This was 1.99% of the UK breeding population estimated at 68,000 pairs (Musgrove *et al.*, 2013). The 1357 pairs estimated to be found in the North York Moors in 2019 was approximately 0.61% of the European breeding population which is estimated as 220,000 pairs (avibirds.com).

3.5.4 Because of local and national declines, curlew has Red Status (BoCC5) and is noted in the NYMNP SSSI citation as part of the important bird assemblage (English Nature 2000).

3.6 Common Redshank *Tringa totanus*

National and Regional Context; *Amber-listed species under BOCC5. Now a rare and scarce breeder on the North York Moors. In Yorkshire good numbers still breed on the saltmarshes of the Humber Estuary (RSPB 2024). The national picture though is one of a 50% decline.*

3.6.1 Redshank breed in damp areas including coastal saltmarshes, inland wet grasslands with short swards, swampy heathlands and grass marshes. Outside of the breeding period, Redshank can be found on flooded grasslands and along estuaries and coastal lagoons. The nest is a shallow scrape on a hummock or at the base of a tuft of vegetation that is often well hidden by overhanging vegetation. The species often nests in loose colonial groups near to the coast.

3.6.2 Redshank begin laying in March and the breeding season can last until August with breeding grounds departed between June and October. Redshanks are single-brooded, laying four eggs per clutch but this can vary between three and five.

3.6.3 The diet includes a wide range of soil, terrestrial and aquatic invertebrates as well as estuarine invertebrates with the number of aquatic invertebrates increasing throughout

the breeding period (Ausden 2003). During the non-breeding season, the species will also eat molluscs, crustaceans and occasionally small fish.

3..4 The UK breeding population of redshank was estimated to be 25,000 pairs (Musgrave *et.al* 2013). In the 2014 survey of the North York Moors National Park two pairs of redshanks were found breeding in the same 1 km square. Because of local and national declines, the redshank has Amber Status (BoCC5) and is noted in the NYMNP SSSI citation as part of the important bird assemblage (English Nature 2000). No redshanks were found in 2019 and again during the 2024 surveys.

4.0 RESULTS OF 2024 SURVEY

4.1 In 2024 the numbers of breeding waders recorded on the survey were as follows: 95 pairs of golden plovers, 105 pairs of lapwings, 62 pairs of snipe and 168 pairs of curlew. With no recorded proof of breeding redshank is therefore omitted from the following results.

4.2 Distribution and Density of Target Species

4.2.1 The distribution and density of all four target species, as illustrated by table 1 and maps that follow in this section (pages 16-19) are summarised. Distribution descriptions (which are not statistical tested) for each species are taken from map interpretation.

Table 1 – Breeding Wader Totals (all waders) Across Different Regions of the National Park

Region	1996	2000	2008	2014	2019	2024
West	66	81	103	125	116	52
North	130	174	107	86	104	89
Central-South	340	356	316	347	298	213
East	44	67	67	75	74	76

4.2.2 Curlew

Figure 1

4.2.2.1 Figure 1 shows a widely scattered distribution across the survey area, with a breeding presence recorded in many squares surveyed. Of the few squares where no breeding

was noted, the majority were in the central-south and east of the area; none in the north and only three with no presence in the west.

4.2.2.2 Densities were typically highest in the north. Breeding densities were at their lowest in the south and eastern areas.

4.2.3 Golden Plover

Figure 2

4.2.3.1 The distribution of breeding golden plovers in 2024 was widespread but patchy. Golden plovers were particularly thinly distributed in the west and eastern areas. Many squares where no presence was found in 2024 are evident across the survey area, with a particular lack of registrations in the west and eastern regions (see table 1).

4.2.3.2 By far the highest densities were found in the central-south area (table 1), with a small number of isolated squares of higher breeding densities in the far north and east (see figure 2).

4.2.4 Lapwing

Figure 3

4.2.4.1 Fig. 3 shows breeding lapwings were absent from large tracts of heather moorland across the entirety of the region but especially in the east.

4.2.4.2 Breeding densities were generally higher in the north and south west and lower in the south east and eastern regions. The majority of squares where densities could be considered high were concentrated in the south-west with one in the central area and one in the north.

4.2.5 Snipe

Figure 4

4.2.5.1 In 2024, snipe were found to be thinly distributed across the whole surveyed region with a lack of presence registered in many squares. Where a presence was recorded, a slight bias towards the central and northern survey area is evident.

4.2.5.2 Squares within which a breeding presence was noted generally hosted low densities, with just a handful where medium or higher densities were recorded.

Figure 1 – Curlew Results 2024 Showing Distribution of Breeding Birds

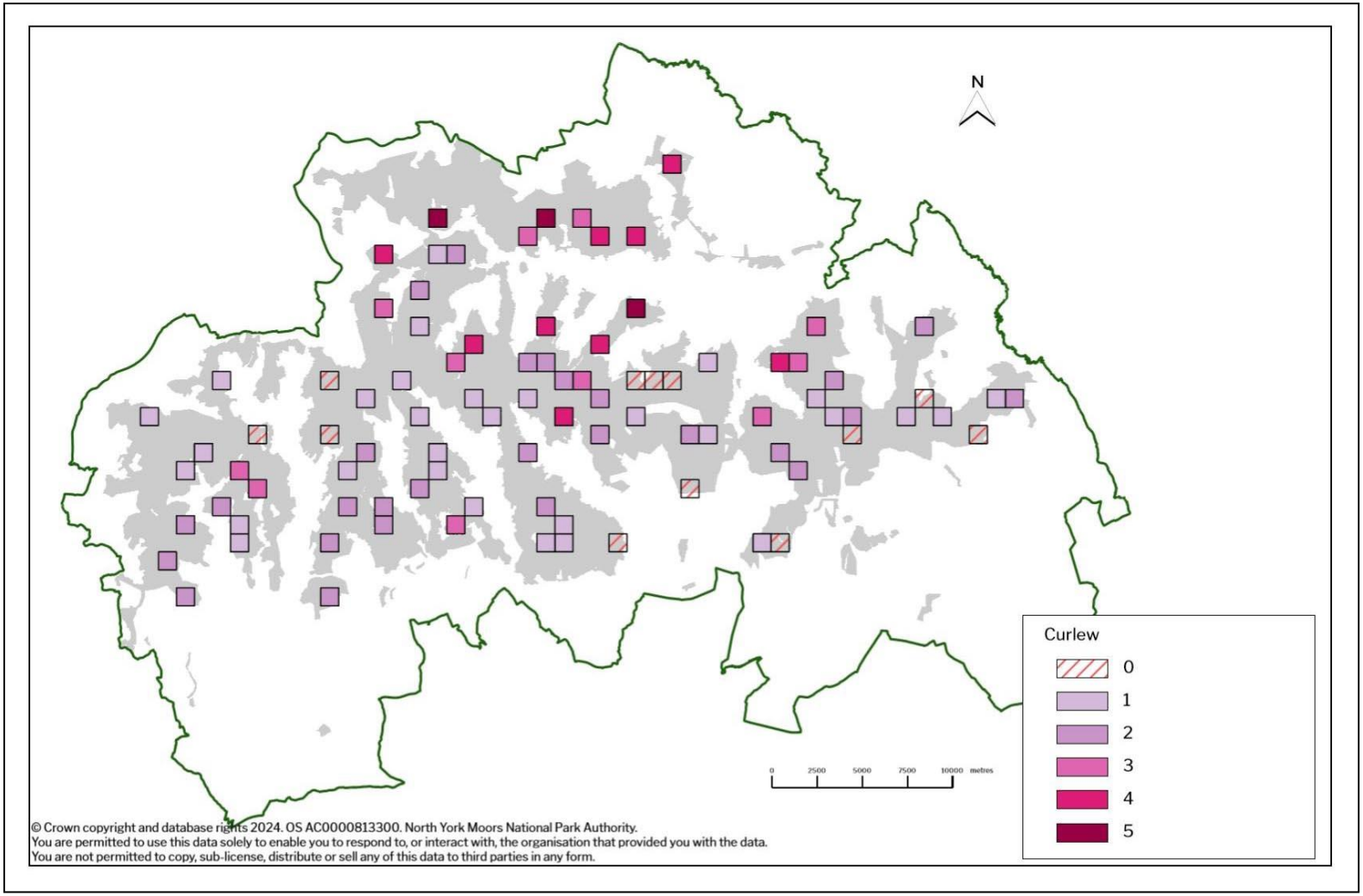


Figure 2 – Golden Plover Results 2024 Showing Distribution of Breeding Birds

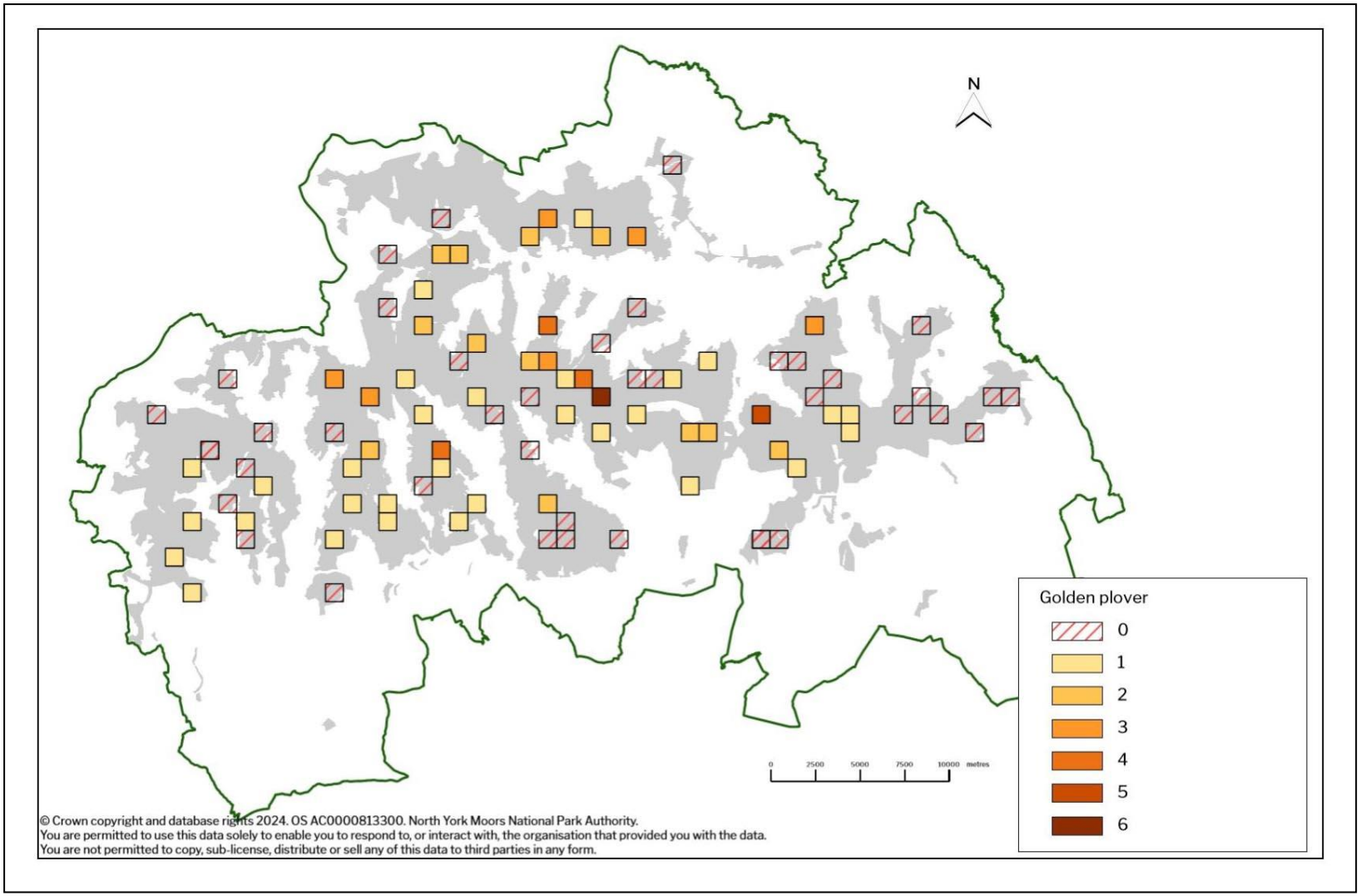


Figure 3 – Lapwing Results 2024 Showing Distribution of Breeding Birds

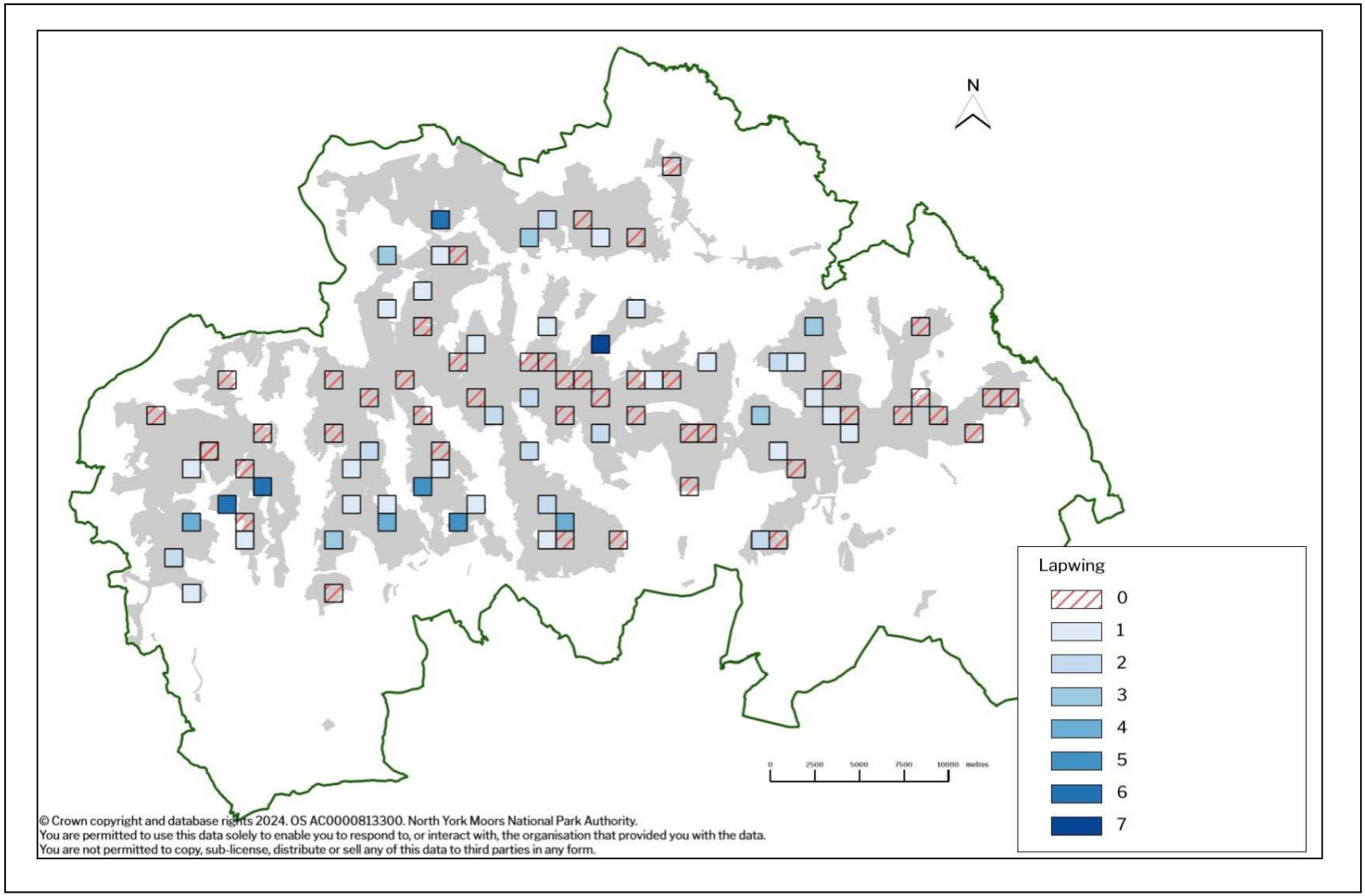
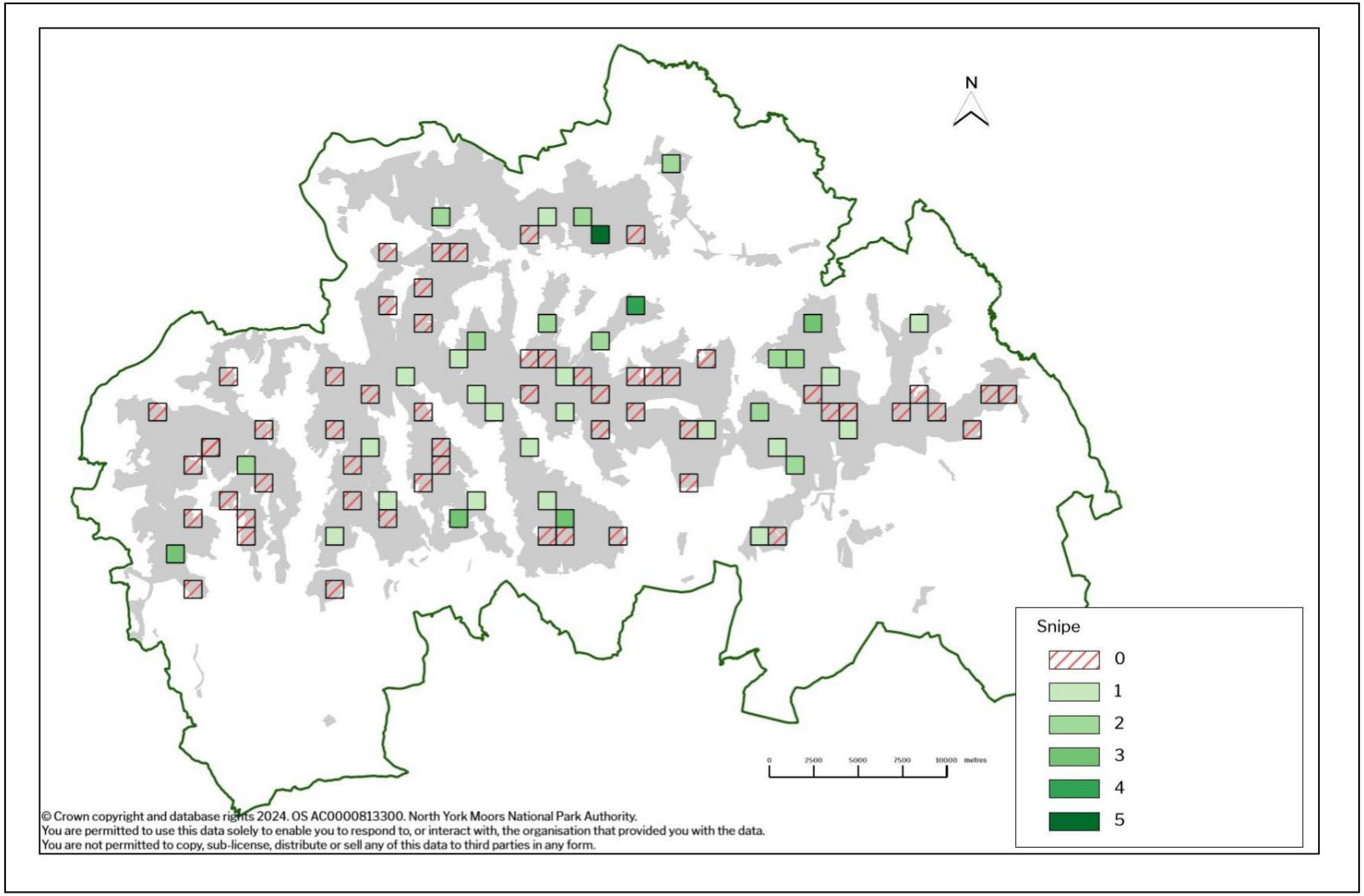


Figure 4 – Snipe Results 2024 Showing Distribution of Breeding Birds



4.3 Comparison of 2024 and 2019 Results

4.3.1 In 2024 a total of 95 breeding pairs of golden plovers were recorded within the survey area, a decrease of 64 pairs from the survey of 2019. Statistical analysis (t=2.83, df.153, s) showed there was a significant difference in recorded populations of golden plovers between the two survey years. Figure 5 below illustrates the comparative numbers of breeding golden plovers recorded across the two surveys in 2019 and 2024.

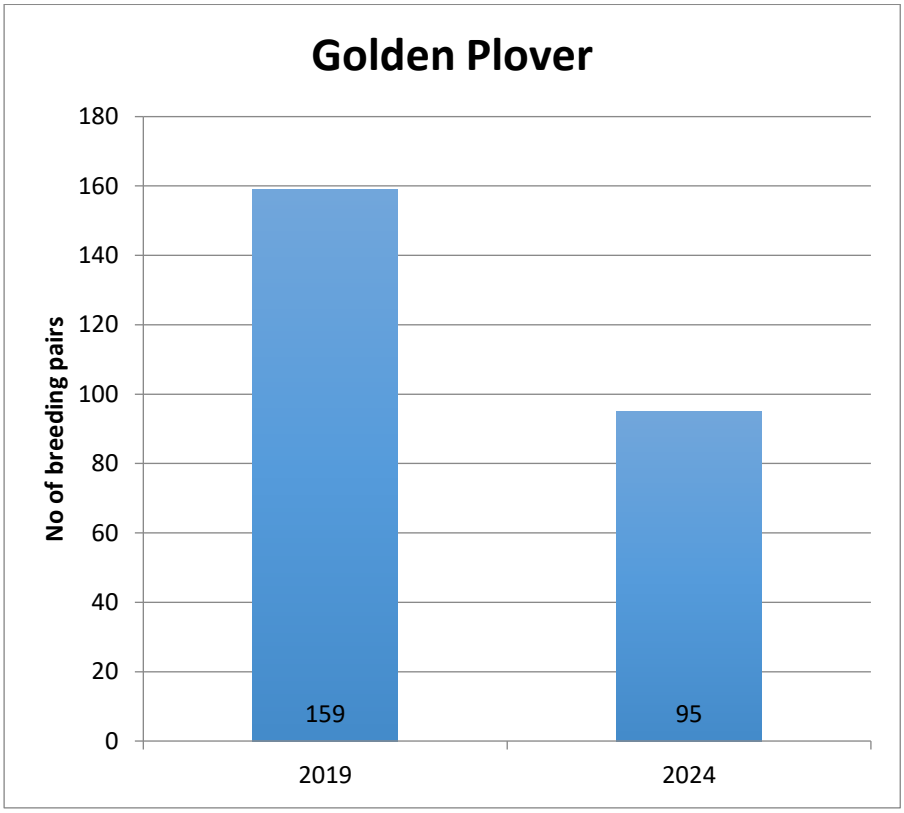


Figure 5 - Comparison of Golden Plover breeding pairs in the two surveys 2019 & 2024

4.3.2 In 2024 a total of 105 pairs of lapwing were recorded as breeding in the survey area compared with 113 pairs in 2019, a decrease of eight pairs Statistical analysis showed there was a significant difference in recorded populations of lapwings between the between the two survey years (t=2.83, df.153, s). Figure 6 illustrates the comparative numbers of breeding lapwings recorded across the two surveys in 2019 and 2024.

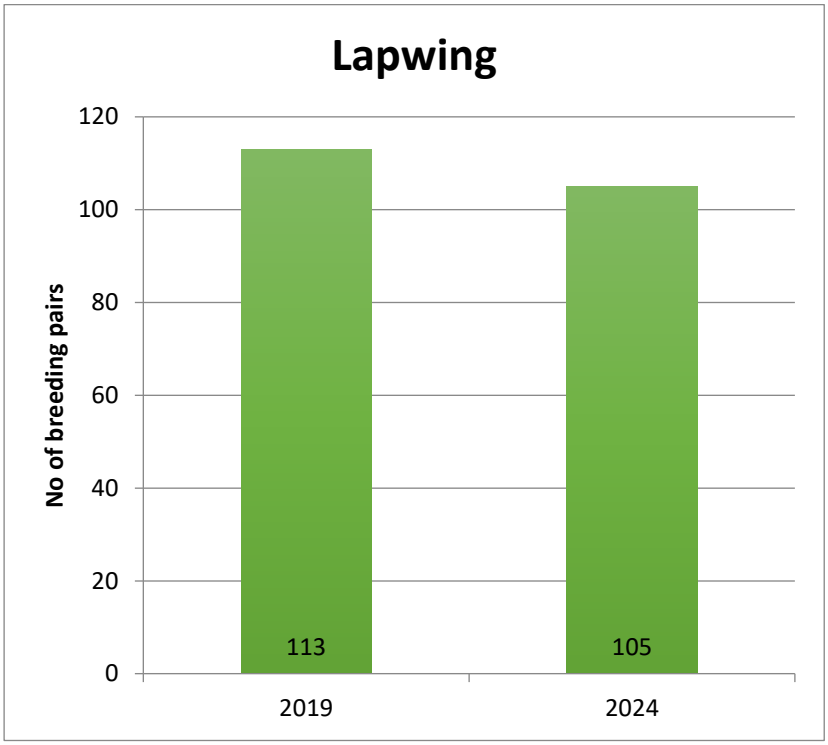


Figure 6 - Comparison of the numbers of Lapwing breeding pairs 2019 & 2024.

4.3.3 In 2024, 62 breeding pairs of snipe were recorded compared with 49 recorded in 2019, an increase of thirteen breeding pairs. Statistical analysis showed there was a significant difference in recorded populations of snipe between the two survey years (t=2.83, df.153, s). Figure 7 below compares the numbers of Snipe across the two surveys in 2019 and 2024.

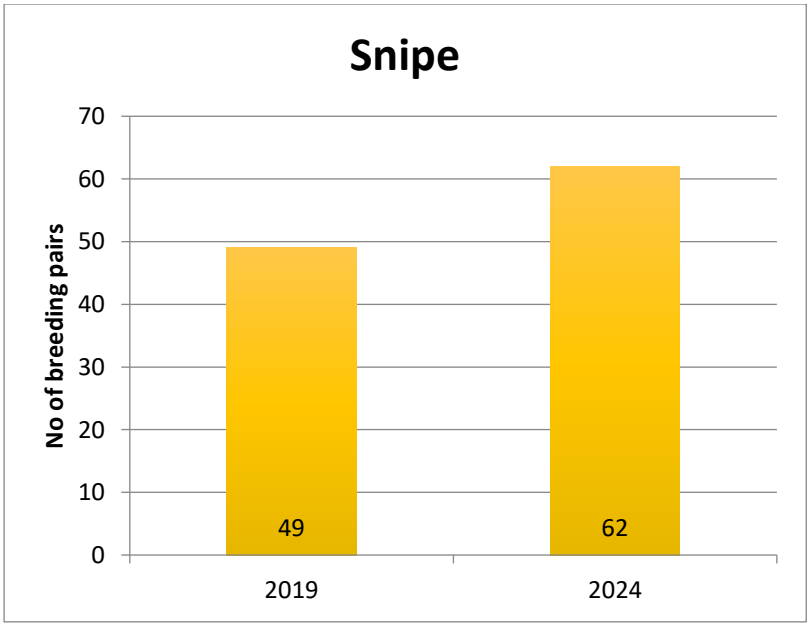


Figure 7 - Comparison of Snipe breeding populations recorded in 2019 & 2024.

4.3.4 In 2024 a total of 168 breeding pairs of curlews were recorded within the survey area, compared with 271 in 2019. A significant decline of 103 pairs between the two survey years a fall of 38%. Statistical analysis showed there was a significant difference in recorded populations of curlew between the two survey years (t=2.83, df.153, s). Figure 8 below illustrates the comparative numbers of breeding curlew recorded across the two surveys in 2019 and 2024.

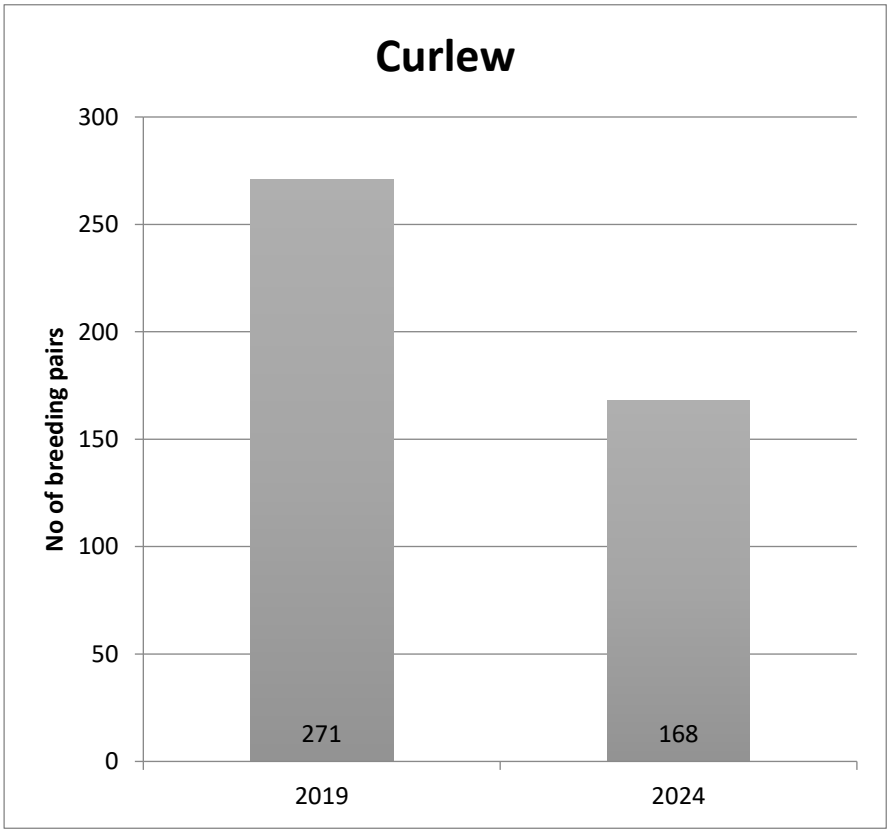


Figure 8 - Comparison of Curlew breeding populations recorded in 2019 & 2024

4.4 Comparison of 2024 with Surveys Since 1996

4.4.1 Following these findings, comparisons were subsequently made between the numbers of different species of waders recorded in each of the six surveys since 1996 (Fig. 10). Table 1 on page 23 details the numbers of breeding pairs recorded in each of these survey years.

Table 2 – Comparison of numbers of breeding pairs of target species found in the survey area over the six surveys

Survey	Golden Plover	Lapwing	Snipe	Curlew	All Waders
1996	154	146	43	237	580
2000	143	182	33	328	686
2008 *	145	121	37	290	593
2014	188	120	43	282	633
2019	159	113	49	271	592
2024	95	105	62	168	430

Caveat Note: * In 2008 a reduced number of squares; 84 were surveyed due to access restrictions

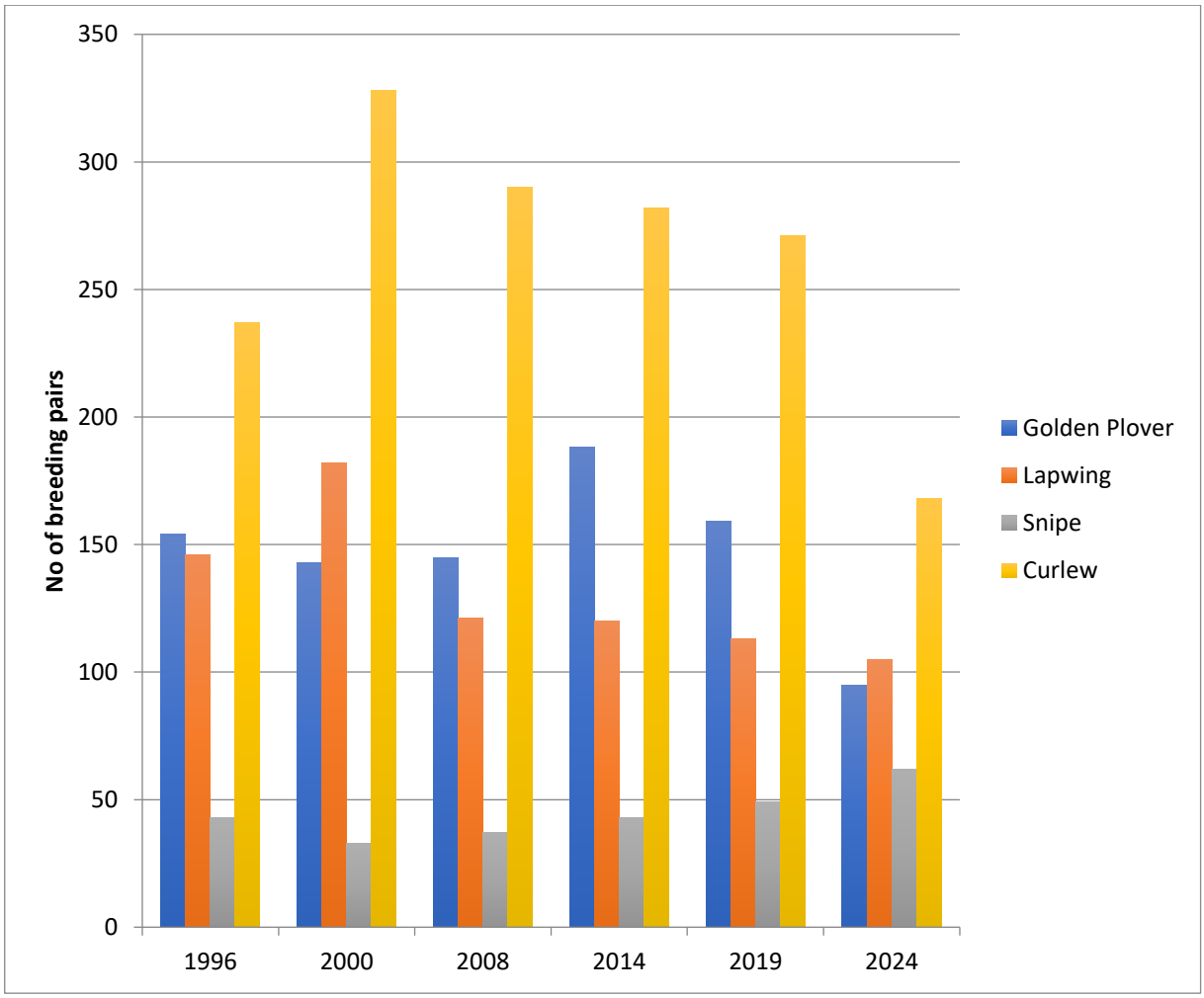


Figure 9 - Comparison of breeding wader totals recorded in each of the surveys within the NYMNP

4.4.2 The total number of breeding pairs of golden plovers recorded in the survey area in each year are shown in figure 11 (page 24). There was some variation in number of pairs found in each survey since 1996, reaching the highest count in 2014. A comparative statistical analysis of the results from each survey found that there was a

significant difference between the six years (X^2=8.31, df=4, X^2c=9.49, ns). Golden plovers have declined by 38% since 1996 and by 49% since the highest count year in 2014.

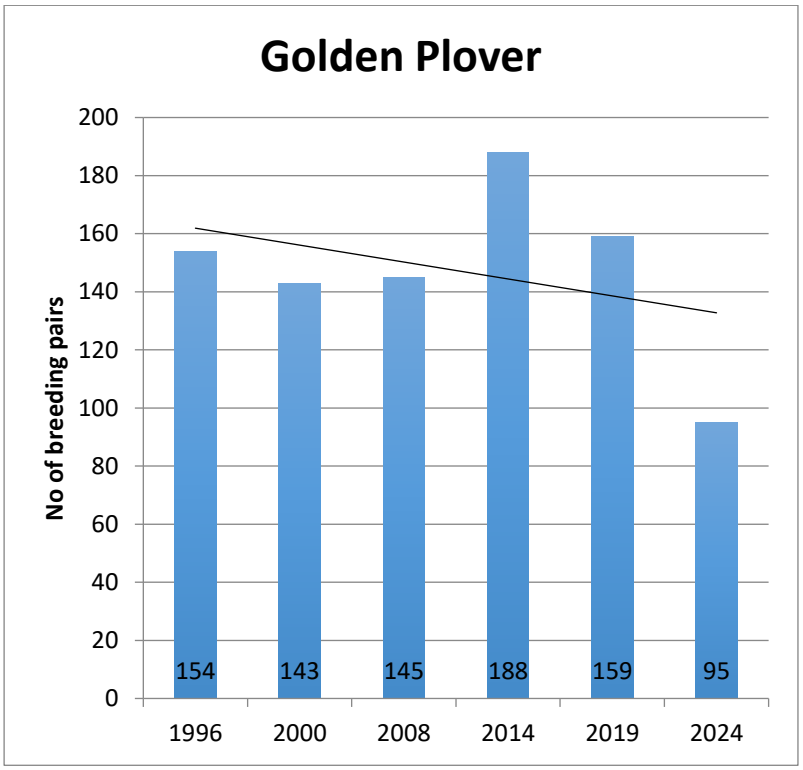


Figure 10 - Comparison of numbers of breeding pairs of Golden Plovers recorded during each survey year.

4.4.3 The numbers of lapwings recorded during each survey year are displayed in Figure 11 (page 25). A comparison across the surveys shows a downward trend in the numbers of breeding pairs; A comparative statistical analysis of the results from each survey found that there was a significant difference between the six years (X^2=8.31, df=4, X^2c=9.49, ns). Lapwings have declined by 39% since 1996 and by 73% since the highest count year in 2000.

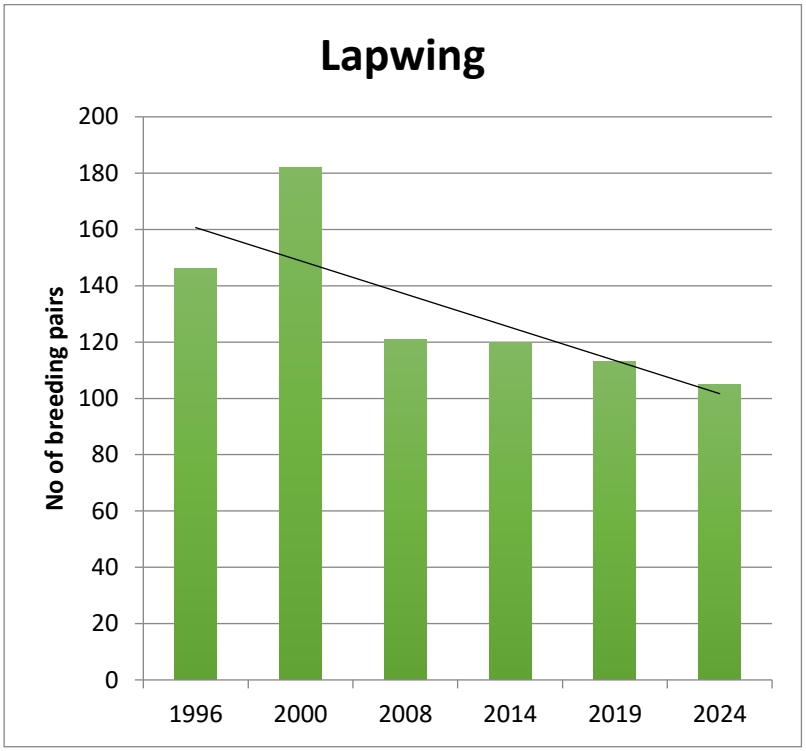


Figure 11 - A comparison of numbers of breeding pairs of Lapwings recorded during each survey year.

4.4.4 The numbers of snipe recorded during each survey year are displayed in Figure 12 below. A comparative statistical analysis of the results from each survey found that there was a significant difference between the six years (X^2=8.31, df=4, X^2c=9.49, ns). Snipe have increased by 44% since 1996.

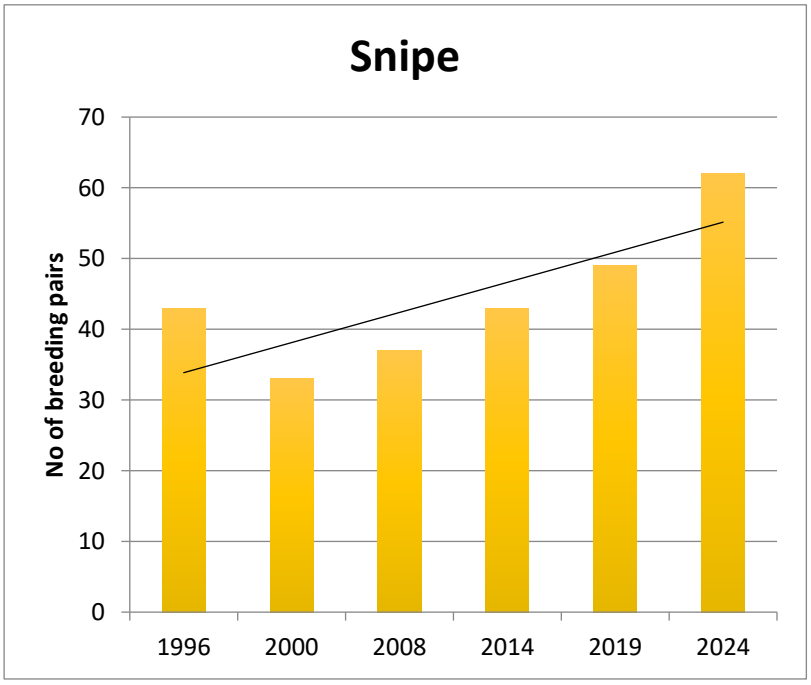


Figure 12 - A comparison of numbers of breeding pairs of Snipe recorded during each survey year

4.4.5 A comparison of the numbers of breeding pairs of curlews recorded in the six surveys is shown below in figure 13. A comparative statistical analysis of the results from each survey found that there was a significant difference between the six years (X^2=8.31, df=4, X^2c=9.49, ns). Curlews have declined by 29% since 1996 and by 49% since the highest count year in 2000.

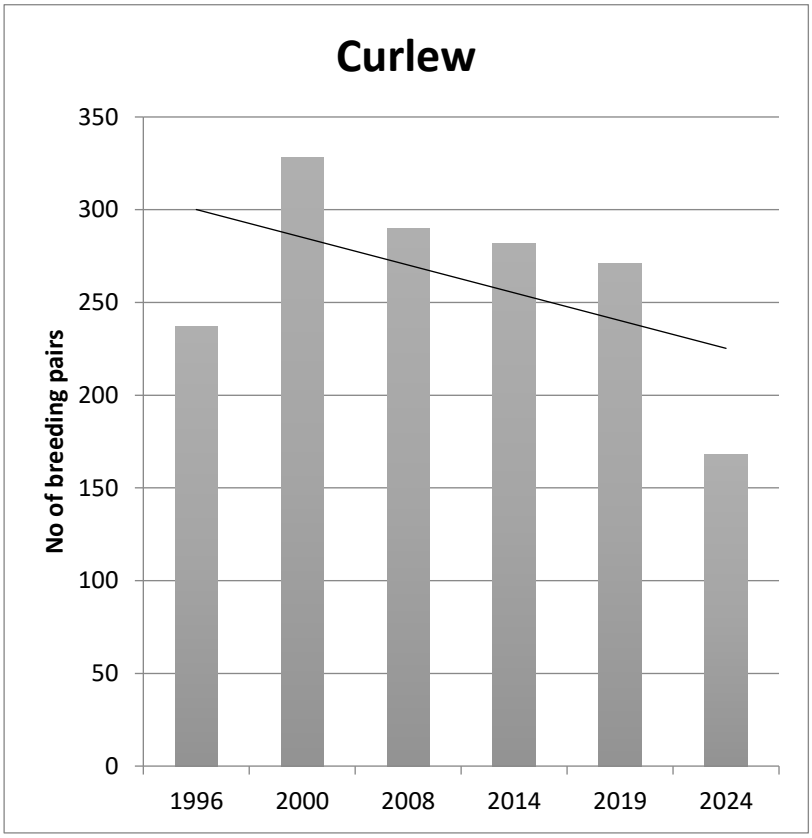


Figure 13 – A comparison of numbers of breeding pairs of Curlew recorded in each survey year.

4.4.6 The breeding densities of the different species of waders from the six surveys are presented in Table 3 page 27. The densities show the mean number of birds breeding per 1km² in the survey area. The difference in densities between the species is interpreted visually in Figure 14 page 27.

Table 3 – Number of breeding pairs per 1km/sq. found in the survey area

Survey	Golden Plover	Lapwing	Snipe	Curlew
1996	1.67	1.59	0.47	2.58
2000	1.55	1.98	0.36	3.57
2008 *	1.58	1.32	0.40	3.15
2014	2.04	1.30	0.47	3.07
2019	1.73	1.23	0.53	2.95
2024	1.03	1.14	0.67	1.83

Caveat Note: * In 2008 a reduced number of squares; 84 were surveyed due to access restrictions

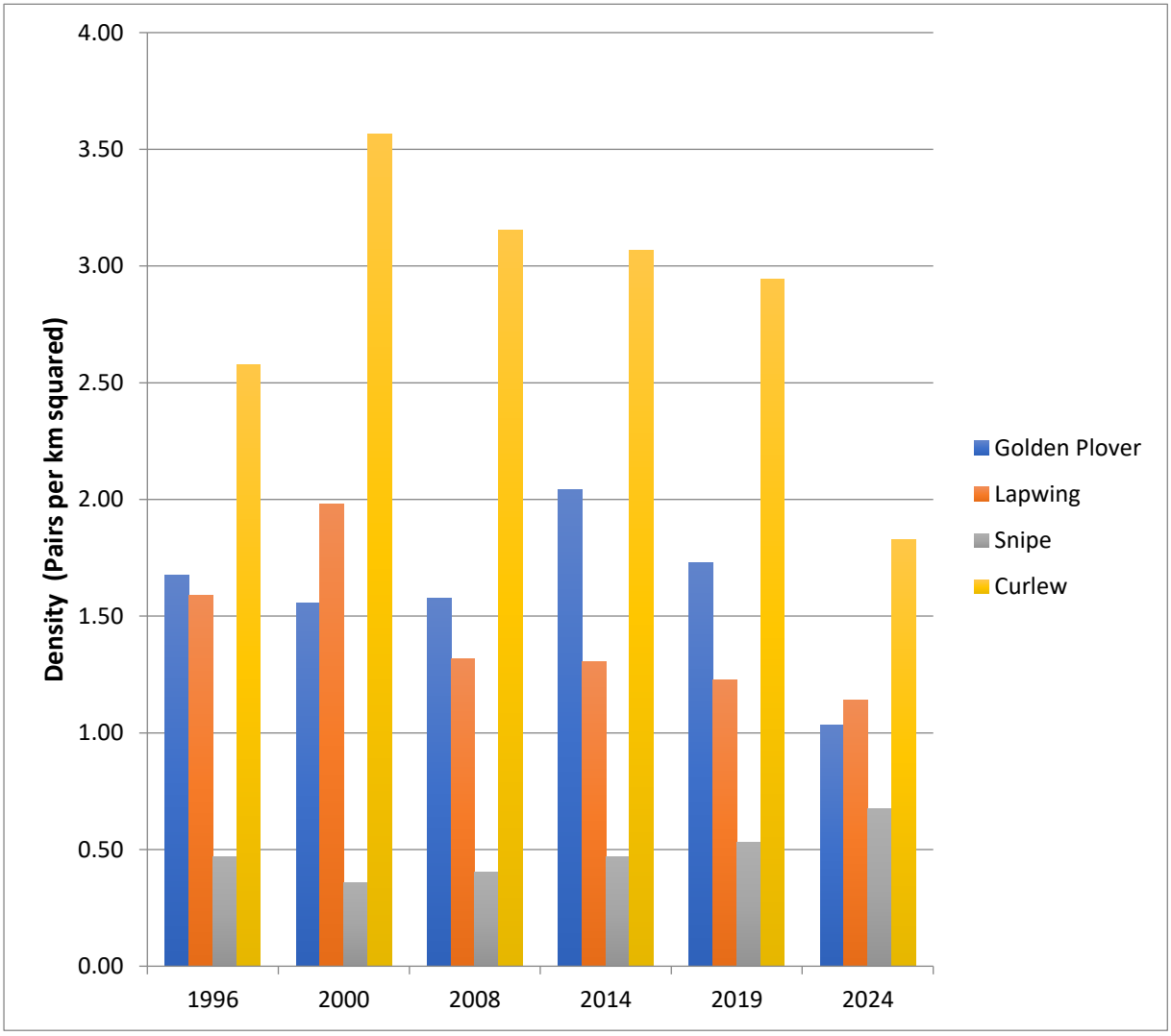


Figure 14 - comparison of breeding densities of the target species over all surveys in the NYMNP

4.4.7 A comparison of the location of breeding pairs of waders within four regions of the survey area is shown in Figure 15 page 28.

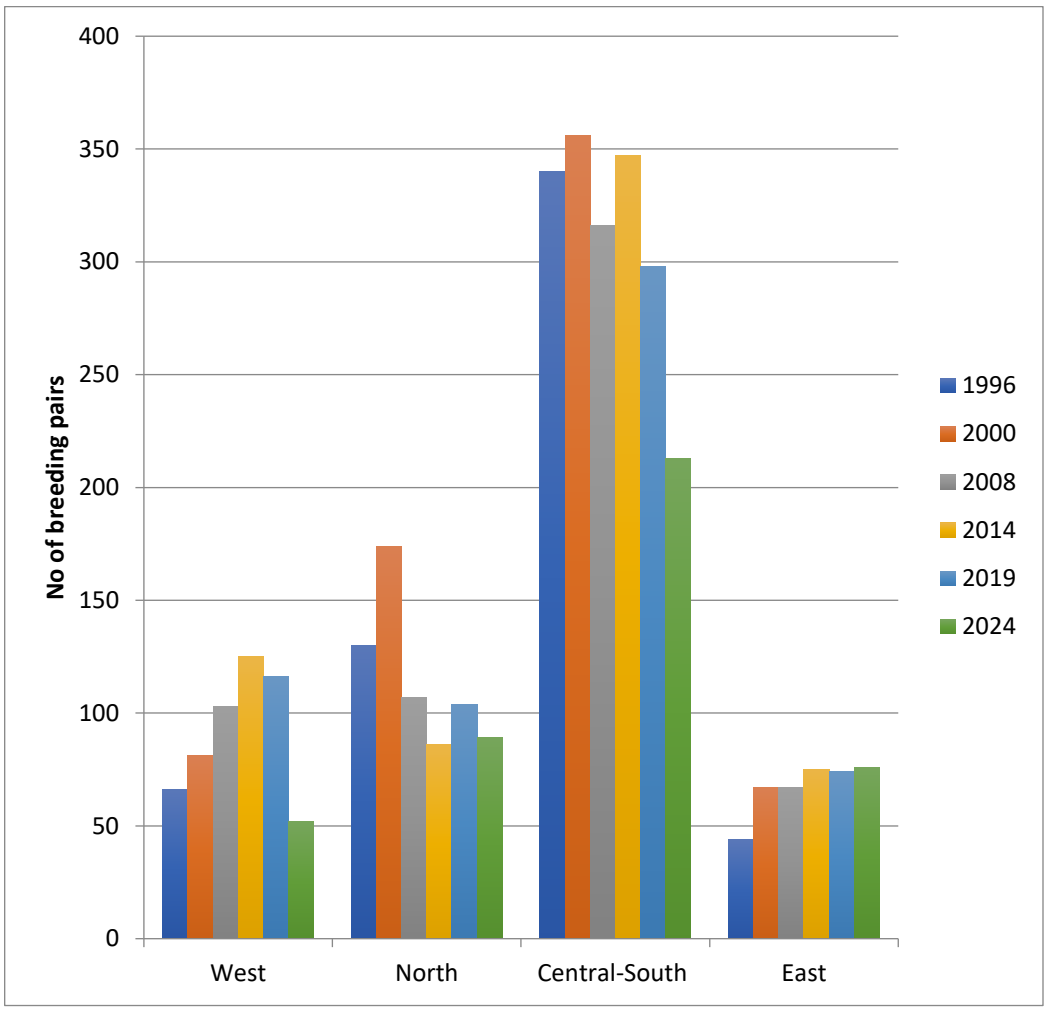


Fig 15 - comparison of overall numbers of wader breeding pairs (Golden Plover, Curlew, Lapwing and Snipe) across the four different regions of the NYMNP over the six survey years.

4.4.8 Figure 15 above illustrates the consistent trend of the largest numbers of all four species are still present in the central-south region despite a large decline in 2024. However, the total numbers in the central region were the lowest in 2024 since surveys began. In east numbers have been gradually increasing since 1996 and still showed a small increase in 2024. In the west numbers fell significantly in 2024 after a small decline in 2019 despite increasing every survey prior to 2019. The northern region showed a decrease compared to 2019, but a small increase compared to 2014.

4.4.9 The differences between regions are most likely to relate to a combination of large variances in habitat, predation control, altitude, slope and climate between the four regions. Statistical analysis of these numbers recorded in different regions confirmed a significant difference between regions ($X^2=64.01$, $df=4$, $X^2c=9.49$, $p<0.05$).

4.5 Peatland Restoration

4.5.1 The maps (Figures 16 and 17, pages 31-32 created by the NYMNP using Earthlight) provide a visual representation of the association between wader populations and peatland restoration. They also show the difference in wader populations from 2019 to 2024 for each survey site. In both maps each square represents the km square that was surveyed with the colours of each square representing the difference in number of birds between the two survey years. The red and orange are indicators of a loss in number of birds surveyed for that area, pale green shows no change, brighter green represents a rise in the number of birds surveyed.

4.5.2 The first map, Figure 16 overlays the overall wader population alongside the peatland restoration areas. The second map shows the relationship between golden plover and the peatland restoration work (Figure 17 page 32).

4.5.3 Table 4 on page 30 records the numbers of pairs of waders including golden plover and also golden plover separately which were recorded within each peatland restoration survey square in the for four years 2008, 2014, 2019 and 2024.

4.5.4 The figures show a negative trend for all waders in two years; 2019 and 2024 for squares within the restoration zones. Numbers fell from 72 pairs to 55 across the two survey years. Four squares increased; one stayed the same but six had lower numbers in 2024 compared to 2019. The overall declining trend was the same for golden plover falling from 27 pairs in 2019 to 23 in 2024. Further analysis is needed to determine precise statistical trends and factors influencing populations of waders within these areas.

4.5.5 These survey squares have at least some of the land areas within a peatland restoration zone. The six-year comparison gives a reflection of trends. The majority of peatland restoration work was carried out between 2009 and 2013. In recent years more work has been carried out in the Bransdale/Rosedale area and on Allerston High Moor in the May Moss area.

Table 4 – Breeding wader numbers in peatland restoration survey squares

Square Number	2008 All Waders	2008 GP	2014 All Waders	2014 GP	2019 All Waders	2019 GP	2024 All Waders	2024 GP
45	5	0	4	1	9	3	7	1
55	8	5	14	10	19	7	7	2
50	7	3	8	5	8	1	3	3
51	6	4	12	6	9	7	4	3
18	3	0	3	0	3	1	4	0
28	2	1	6	2	3	1	3	1
31	5	2	6	2	7	1	6	1
23	2	1	3	1	3	1	4	1
24	5	4	8	3	5	2	7	4
30	3	2	5	2	3	2	8	6
32	7	3	4	1	3	1	2	1
Totals	**53**	**25**	**73**	**33**	**72**	**27**	**55**	**23**

4.5.6 The results above show all 11 survey squares had breeding waders present in every one of the survey years 2008, 2014, 2019 and 2024. Over three years prior to 2024 the trend for all waders had been positive, increasing from 53 pairs in 2008 to 72 and 73 respectively in 2014 and 2019. However, the totals show a decline to numbers close to the 2008 totals in the 2024 season, reversing the previous upward trend. Golden plover numbers in 2024 were the lowest of the four years but close to 2008 totals. In the restoration squares all waders including golden plovers peaked in numbers in 2014.

4.5.7 Only one square, number 18 returned zero golden plovers in 2024, however this square only had one pair of golden plovers breeding in 2019. Interestingly no golden plovers were found in this square in 2008 or 2014. It is also worth noting that the low numbers of golden plovers compared to previous years in the peatland restoration areas were also reflected in the overall survey results.

4.5.8 Despite the decline in wader numbers in the peatland restoration squares during 2024, the results show that every square was occupied by at least two pairs of breeding waders. The conservation of peat and its associated water levels is highly likely to create improved resilience in wader populations, allowing birds to return in larger numbers after excessively dry years.

Figure 16 – GIS Map Showing Difference in Breeding Waders across the Survey Plots between 2019 and 2024. The numbers in the legend refer to the difference in wader numbers between the two years of surveys

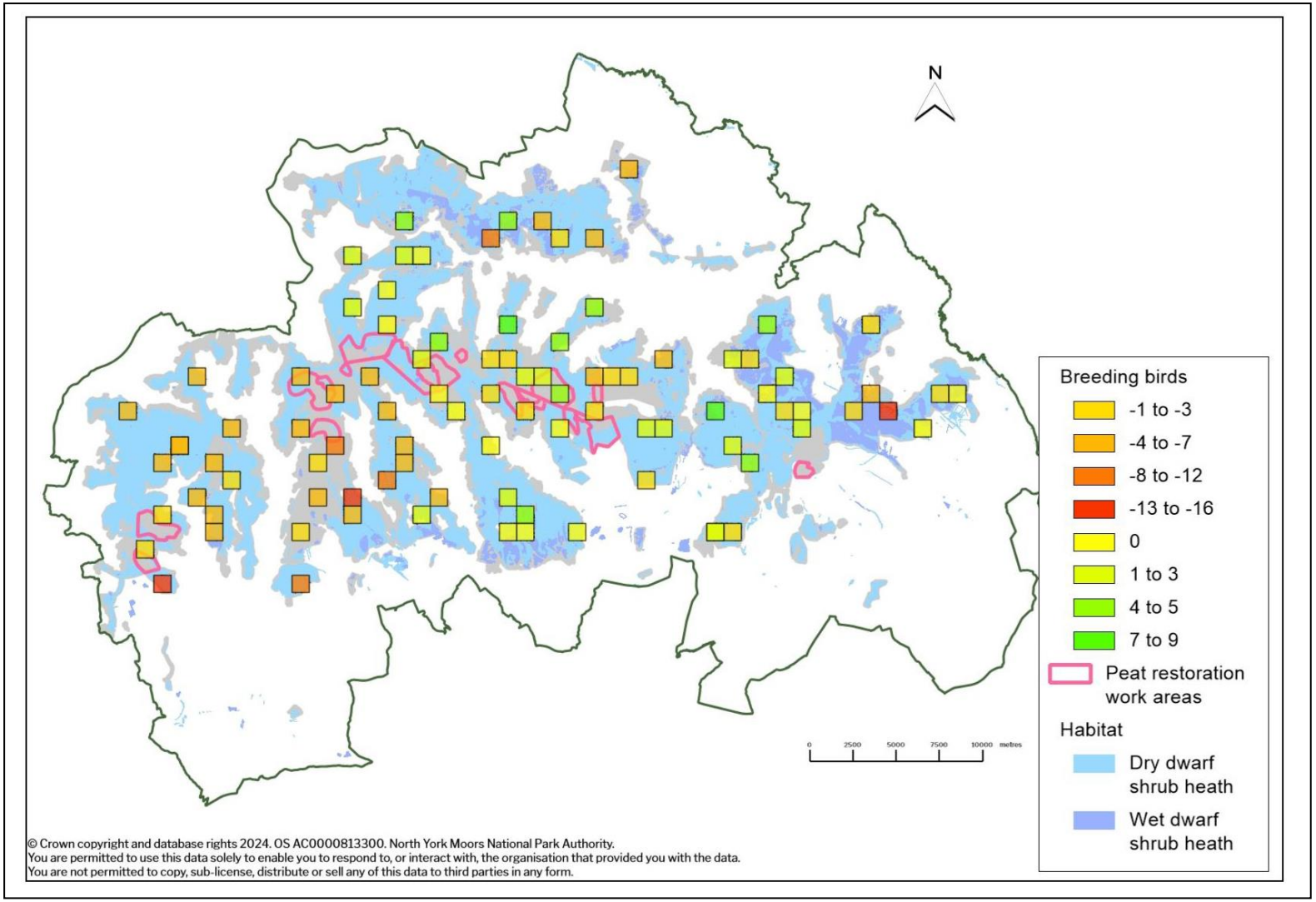
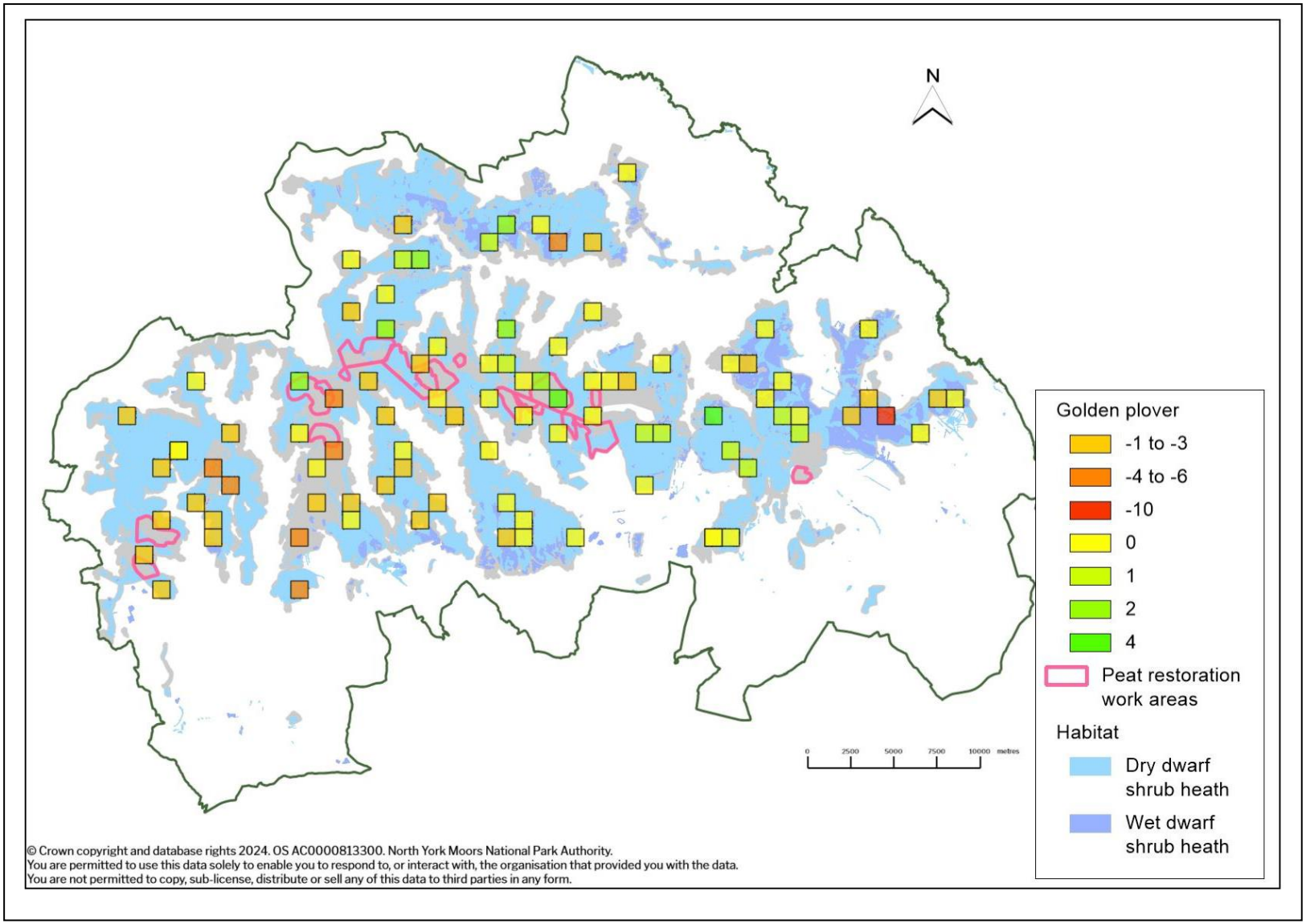


Figure 17 – GIS Map Showing Difference in Golden Plover Population across Two Survey years 2019 and 2024



5.0 EVALUATION OF TRENDS

5.1 Comparison of results of the 2024 wader survey with those of the 2019 survey show that there was a significant statistical change in the numbers of breeding pairs of the four key species. Three out of the four species showed a continued decline with only common snipe populations increasing. Curlew numbers dropping from 271 pairs in 2019 to 168 pairs in 2024, from a high of 328 pairs in 2000. The golden plover results show a significant fall from a high of 188 pairs in 2014 to just 95 pairs in 2024. Lapwing also showed a significant decline with an overall 39 % decline in numbers between the original survey in 1996 and the current one in 2024.

5.2 Survey Area

5.2.1 The survey area in this assessment is identical to that used in five out of six of the previous studies, with 92 x 1km squares being surveyed again in 2024. The innate randomness of sample sites chosen could affect the results through exclusion of specific areas that are of high importance to some species, for example particularly wet/marshy areas or in-bye land close to agricultural areas with high invertebrate populations. It could also result in clustering of points around areas when spacing is not considered. This has the potential to produce some skew in the results or cause under-estimation in the number of waders when specific areas are not included.

5.2.2 Although using the same sites allows some level of continuity across the studies it does not consider any habitat changes to the areas or fluctuations in climate. Within the National Park, the habitat is often altered for several reasons including management by burning, cutting and cropping as well as peatland restoration. These waders are not averse to moving to adjacent sites if an area becomes unsuitable and if their new location is an unmonitored square this bird will become a loss in the following survey records. Although this report has looked at some habitat change by incorporating peatland restoration whilst looking for trends there is still a large amount of land use changes that can occur and alter wader numbers without being factored into the trends.

5.2.3 The results deal with relatively small population numbers which can be highly influenced by several factors therefore caution should be practised when evaluating any definitive trends. The whole sampling system allows for both growth and reduction in numbers to go unrecorded as there are many locations that are not surveyed so all statistics and patterns found should be considered with this caveat.

5.3 Species Evaluation

5.3.1 Golden Plover

5.3.1.1 In 2024 just 95 pairs of golden plovers were recorded breeding across the 92 survey squares within the North York Moors National Park, a continuing decrease from the high point of 188 pairs in 2014. Statistical analysis showed that this difference in populations between survey years was significant. It should also be noted that these figures were biased by a small number of squares with large numbers of birds, it is important to recognise that 64% of squares returned either no pairs or just one pair. The concentration of high numbers of golden plovers in a relatively small number of squares in 2024 appears to be consistent throughout the survey years. Yearly percentages of 0-1 return from squares; 1996=54%, 2000=60%, 2008=56%, 2014=48%, 2019=61%, 2024=64%. These figures may illustrate a tendency for golden plovers to breed in higher numbers in preferred habitat such as higher open moorland with cotton grass flushes. This positive selection concentrates more birds into fewer squares. It becomes more apparent when the population is lower and/or suffers stress from adverse climatic pressure i.e. dry winter/spring.

5.3.1.2 The survey of 2024 showed that golden plover within the National Park had a breeding density of 1.03 pairs/1km^2 within the 92 survey squares. This density was significantly lower than that of 2019 which was 1.73 pairs/km^2.

5.3.1.3 The extrapolated population for the whole moorland area in 2019 was 795 pairs. This number was approximately 2.1% of the estimated UK breeding population of 38,000 pairs (Musgrove *et.al.* 2013). The extrapolated population for the whole moorland area in 2024 was 474 pairs which is 1.4% of the current estimated UK population breeding population of 33,000 pairs (BTO 2024).

This 2024 estimated population is approximately 0.10% of the European breeding population estimated as 460,000 pairs (avibirds.com).

5.3.1.4 Prior to 2008 the population remained relatively unchanged since the surveys began in 1996. In 1996, 154 pairs bred but dropped by 12 pairs in 2000 to 143, it then rose again to 145 by 2008. 2014 was the best year with 188 pairs. The relatively large fall to 159 pairs in 2019 and to 95 pairs in 2024 should therefore be considered with caution as it relates to a fall from an exceptionally good year in 2014. A major constraint to numbers in 2024 is likely to have been the unusually wet early spring (see land management recommendations page 42). The six-season average is 147 pairs therefore the 95 pairs in 2024 is a very significant drop on the average and although the spring weather was no doubt an influence, the figures are an undoubted red flag.

5.3.2 Lapwing

5.3.2.1 In 2024 a total of 105 breeding pairs of lapwings were recorded within the survey squares. This was eight less pairs than in the 2019 survey when 113 pairs were recorded. Statistical analysis showed the difference between 2019 and 2024 to be significant. In summary the trend in lapwing population is declining survey-on-survey despite a peak year in 2000. It is also important to recognise that 2024 was the lowest mean density of lapwings since the surveys started in 1996.

5.3.2.2 Nationally, lapwings have shown a decline since 1962 (Shrubb & Lack 1993). This trend appears to be continuing with the latest figures showing further declines nationally of -14.3 % between 2017-2022 (BTO 2024). In 2024 it is thought that breeding birds were also negatively affected due to unfavourably wet weather conditions during the spring. These additional factors simply aggravating long-term declines thought to be caused by habitat loss, land drainage and predation pressure.

5.3.2.3 In the 2008 survey evaluation there were statistically significant differences between the recorded numbers of lapwings found across the three surveys. However, by 2014 the population numbers appear to have stabilised resulting in no significant difference between the four surveys despite the variation of 25 more breeding pairs from 1996 to 2000 then a loss of 60 breeding pairs from 2000 to 2008. It is likely that these fluctuations are due to changes of habitat in the survey area throughout the years. The

stability that appears in the latter years could be because of habitat management being more suitable for lapwings and therefore alleviating the effects on a local scale of the national trend of a decline in numbers. However, it is worth noting that the downward trend has continued during every survey since the peak in 2000. A factor here could be that part of the reduction or change in bird numbers between years on the moorland is caused by local movement of breeding colonies away from the moor onto inbye land that has since changed in management. This change on the inbye could temporarily improve habitat for lapwings on a very local scale e.g. increased grazing or a decrease in grazing pressure. Equally a switch from grazing to an early silage cut could damage lapwing populations adjacent to the moor. The relationship between movement of birds between inbye land and moorland is therefore likely to be complex and depend on the availability of suitable habitat in both areas.

5.3.2.4 The survey of 2024 showed that lapwings within the National Park had a breeding density of 1.23 pairs/km^2. The extrapolated population of lapwings across the entire moorland area was therefore 566 pairs which is approximately 0.60% of the UK breeding population estimate of 98,000 pairs (BTO 2024). The importance of the NYMNP lapwing population relative to the UK population has therefore increased in 2024 as the UK population has declined. In 2019 the NYMNP population was calculated as 0.40% of the UK population.

5.3.2.5 This is approximately 0.03% of the European breeding population estimated at between 1,590,000 and 2,580, 000 pairs (Birdlife, 2024) a decline from 0.04% in 2019.

5.3.3 Snipe

5.3.3.1 In 2024 a total of 62 pairs of snipe were recorded breeding within the survey area of the North York Moors. This was an increase of thirteen pairs on the 2019 survey. Statistical analysis showed there was a significant difference between the two years, and between the numbers of breeding pairs recorded across the four survey years. In summary the trend in the population of Snipe within the North York Moors remained stable between 1996 and 2019 and is now showing an increase. A caveat to these results should be the considered in relation to the unusual wet conditions in the spring of 2024. These conditions may have made the birds more active and therefore easier to

detect. Recent BBS data also shows a regional increase in snipe numbers on Breeding Bird Survey (BBS) plots (BTO 2024).

5.3.3.2 Although the species appears to remain stable, with a breeding density of 0.67pairs/km^2 in 2024 the actual numbers have not varied much since the first survey in 1996. The numbers recorded are also much smaller than that of golden plover, lapwing and curlew. It is likely that this reflects the difficulty in surveying the species and these results may give a false impression of which parts of the moor are particularly good for snipe.

5.3.3.3 The extrapolated population of snipe for the whole moorland area was 308 pairs. This is 0.4% of the UK breeding population estimate of 67,000 pairs (BTO 2024) and is approximately 0.03% of the European breeding population estimate of 930,000 pairs (avibirds.com).

5.3.3.2 This assessment is made with the caveat that snipe is generally considered to be under-recorded using the Brown & Shepherd methodology due to their peak activity time being highly specific, i.e. at dusk and during periods with low wind speeds (Hoodless *et.al* 2006). Additionally, snipe often have larger breeding densities on marshy grassland or acid flush rather than on heath (Hoodless *et.al.* 2007). Within the landscape of the NYMNP this habitat is far more likely to be found on in-by land (closer to the farm than on the high moor) and at lower altitudes than heather moorland and within upland farm holdings.

5.3.3.3 On the NYMNP surveys snipe were often flushed from locations that were wetter or uneven sward length where their favoured prey could be found. These sites often included wet drains or linear drainage ruts close to roads and tracks which were often outside of the survey plots (R. Baines *pers. comm.*). It is highly likely therefore that this species has been under-estimated due to the highly specific peak activity time for snipe (outside of the wader survey time method) and a large proportion of optimal habitat not being included (see Section 8, Survey Recommendations).

5.3.4 Curlew

5.3.4.1 In 2024 a total of 168 breeding pairs of curlew were recorded within the survey area of the North York Moors. This was 103 fewer pairs than in 2019 when 271 pairs were recorded.

5.3.4.2 Statistical analysis of the recorded numbers of breeding curlews collected since the beginning of the five surveys in 1996 shows that there was a significant difference between the years. The survey in 2000 showed an increase of 91 pairs from 1996, followed by a decline of 40 breeding pairs by 2008. This overall decrease in numbers follows the current national trend in wader species.

5.3.4.3 The 2024 survey showed that the breeding density of curlew within the North York Moors National Park was 1.83 pairs/km^2. Down from 3.75 prs/km in 2000.

5.3.4.4 The extrapolated population for curlew across the whole moorland area in 2024 was 842 pairs. This is 1.4% of the UK breeding population currently estimated at 59,000 pairs (BTO 2023). The National Park population has therefore declined in importance from 2% in 2019 to 1.4% in 2024. This extrapolated population has declined markedly from 1357 pairs in 2019 to 842 in 2024. Over a longer period, the North York Moors curlew population has declined by 29% between 1996 and 2024 or 48% between 2000 and 2024.

5.3.4.5 To put these local figures into context, the national UK Curlew population fell by 50% between 1995-2022 and over the same period suffered a range contraction of 19.2% (BTO 2024). The North York Moors curlew population has therefore mirrored the national decline.

5.3.4.6 The 842 pairs estimated to be found in the North York Moors is approximately 0. 4% of the European breeding population which is estimated as 220,000 pairs (avibirds.com) this is a fall of importance from the 2019 calculation of 0.62%.

5.3.4.7 Similar to the other wader bird species curlews are vulnerable to changes in habitat, such as improved drainage, afforestation, extensive burning and unchecked growth of moorland vegetation. These factors can all cause birds to move and breed elsewhere.

However, despite the possibility of being affected by these factors they are also capable of using grassy margins and pastures to find food and will frequently forage in enclosed silage fields and hay meadows well away from moorland nest sites. A large part of the population decline is a fall in breeding productivity with many nesting attempts failing at the egg and small chick stages. Nest predation and human disturbance play a large part in this. (Curlew Recovery Project 2024). The North York Moors National Park population is declining at the same time and level as national trends despite legal predator control.

5.4 Regional Trends

5.4.1 The results from 2024 show an apparent strong difference in breeding numbers of waders in association with their location within the National Park. It appears from the results that waders are more likely to be recorded in the central and northern region of the park compared with other regions and biased between east and west with more birds being found in the west than the east. It is likely this is due to subtle or major differences in habitat management and/or local climate across these regions of the NYMNP. These differences could include changing levels of heather burning or inbye land management changes or loss as examples. Factors such as local climatic influences elevation and topography may also be affecting habitat suitability.

5.4.2 It is possible that the location of the survey squares/survey sites could be responsible for some of the bias especially if there are more survey sites in one region than another. It is also possible that some areas/habitats, such as cotton grass bogs, are either over-represented or under-represented so this apparently significant difference between the regions should be approached with caution and may merit further study.

6.0 MEADOW PIPITS AND ADDITIONAL SPECIES

6.1 This section includes other key birds recorded on the survey. These include any Schedule 1 protected species (Wildlife and Countryside Act 1981 as amended) and/or key species identified by the NYMNP as significant due to their conservation status as UK BAP/LBAP species which are species of conservation concern as described in *The*

Population Status of Birds in the UK (Birds of Conservation Concern 5 2021) and/or additional species deemed notable by the NYMNP.

6.2 Surveyors were required to record meadow pipits as a tally of actual numbers of birds counted during the survey with care not to over record birds. Meadow pipits were also counted on the 2014 and 2019 survey but not on any NYMNP wader surveys previously. Table 5, 6 and 7 present the results of meadow pipits in the each of the three years (both visits). Table 8 presents the results of each additional species (without meadow pipit) recorded in 2024 as cumulative over both visits.

6.3 The following tables give an indication of the potential population and distribution of these additional species. However, the count results should be used with caution. Each species and/or suite of species require either a different generic survey or a species-specific survey to accurately survey their populations. Despite this constraint the results do show trends consistent with national survey results.

Table 5 – Meadow Pipit Counts 2014

2014 Total Birds	***Max Count from Each Square Total**	**Peak Visit Count & Square/s**
7395	4547	111 on visit 2 in NZ6902 & SE6194

Table 6 – Meadow Pipit Counts 2019

2019 Total Birds	***Max Count from Each Square Total**	**Peak Visit Count & Square/s**
5182	4480	88 on visit 2 in SE5089 & SE6097

Table 7 – Meadow Pipit Counts 2024

2024 Total Birds	***Max Count from Each Square Total**	**Peak Visit Count & Square/s**
3441	2180	59 on visit 1 in NZ6108

* 'Max count from each square' takes the largest count from either visit as the accurate figure

Table 8 – Additional Species Counts

Species	**2024 Total**	**Peak Count**	**Number Squares**	**Peak Grid Square/s**
Common Redstart	5	2	4	SE6097
Whinchat	7	6	2	SE6395
Ring Ouzel	24	6	11	SE5393

Common Cuckoo	22	2	16	NZ9600 & SE9498
Spotted Flycatcher	2	2	1	NZ8500
Tree Pipit	1	1	1	NZ7902
Common Raven	5	2	4	NZ6410
Common Kestrel	35	3	24	SE5093
Merlin	7	2	4	SE6097
Peregrine	4	1	4	NZ6603, NZ6105, NZ6201 & NZ5801
Red Kite	40	4	24	SE5294
Common Buzzard	52	6	23	NZ7701
Eurasian Hobby	4	1	4	NZ7601, SE5197, SE5495 & SE5093
Short-eared Owl	3	1	3	NZ6000, NZ8601 & NZ6508
Marsh Harrier	3	1	3	NZ6408, NZ7101 &
Hen Harrier	2	1	2	NZ7002 & SE6496
Northern Goshawk	2	1	2	SE8496 & SE8292

6.4 Meadow Pipits and Additional Species Results and Discussion

6.4.1 The 2024 meadow pipit results provide an opportunity to compare results with two previous survey years. The cumulative total for 2019 was 30% lower than in 2014. However, the total birds calculated as the maximum number recorded for each square over both visits in 2014 and 2019 was very similar with only a 1.5% decline since 2014. In 2024 however the results showed a significant decline in numbers down to 3441 total birds, a 53% decline over the three survey years from 7395 the highest number in 2014.

6.4.2 In 2024 the surveys recorded a mean of 23.70 birds/square compared to 48 birds/square in 2019 and 49 birds/square in 2014 a 52% decline since 2014.

6.4.3 Visit 2 counts should in theory increase after successful breeding (fledged juveniles) compared to visit one. In 2014 this was a very clear trend with 80 squares of the 92 squares recording maximum numbers on visit 2. In 2019 the figure was much lower with only 56 of the 92 squares showing higher numbers on visit 2 than visit 1. In 2024 surveys this declining trend continued with visit 1 recording 1724 birds compared with a slightly lower total of 1717 on visit 2. More squares: 46 in total 50% showed a decline in birds on visit 2 compared with a lower total only 42 squares showing an increase and 4 which stayed the same across both visits.

6.4.4 In 2019 we concluded that the fall in cumulative total numbers coupled with the large decline in visit 2 square max counts was highly likely to be caused by a poor breeding season in 2019. In 2024 this was an even clearer trend with more squares declining than increasing in numbers.

6.4.5 The reasons for this fall in numbers in 2024 compared with both 2019 and 2014 may relate to either or a combination of habitat change through land management changes and/or climatic changes in spring 2024. The spring of 2024 was notably very wet with much higher-than-normal rainfall which created localised flooding and higher water levels across the survey area. The timing of his wet weather coincided with the breeding season of many resident birds including meadow pipits. It is highly likely therefore this weather adversely affected the breeding season of meadow pipits in 2024.

6.4.6 The fall in meadow pipit productivity in 2024 is also likely to have adversely affected the success and numbers of major predators of meadow pipits in these areas especially merlin *Falco columbarius*.

6.4.7 In the additional species table the most regularly recorded species was common buzzard with 52 individuals found in 23 squares, 25% of the 92 squares compared to 51 birds found in 36 squares in 2019. The 2024 totals are almost the same number of birds as in 2019 but a fall in distribution when buzzards were found in 39% of squares. Red kite was the next most numerous species recorded with 40 birds found in 24 squares 26% of all squares. Only two red kites were recorded on the 2019 surveys indicating a large increase in the five years between surveys. Common kestrels *Falco tinnunculus* were also found to be widely distributed with 35 birds found in 24 squares.

6.4.8 Other less well observed species were also noteworthy; A total of 24 ring ouzels *Turdus torquatus* was very similar to the 22 found in 2019.

7.0 LAND MANAGEMENT

7.1 This section aims to combine findings and discussion from the NYMNP surveys with both regional (north of England) and national (UK) habitat preferences for each species within the study. A final bullet point list of land management recommendations

is then given for each species based on these local, regional and national results. The focus of this section is on habitat priorities and management. The role of predator control is discussed but, in less detail, as it lies outside of the brief of this study.

7.2 UK-wide Factors Causing Declines in Upland Wader Populations

In the majority of cases involving these declines, not one factor is the single cause of decline but rather all act together to make conditions less suitable for breeding waders.

- Removal and fragmentation of habitat which includes drainage and afforestation
- Predation from mammals, including domestic sheep, and corvids
- Spring machinery operations
- Recreational disturbance such as hiking, dog walking & cycling
- Climate change
- Insect abundance

7.3 Golden Plover

7.3.1 The importance of a range of suitable feeding habitats including both moorland and enclosed fields for adult golden plover within a locally diverse habitat network has been established in previous studies. Whittingham M.J (2000) found that during incubation adult birds mainly fed in enclosed grassland fields between 1.1 and 3.7 km from the nest. Only 5% of their feeding time during incubation was spent on the moorland. After the eggs had hatched there was a dramatic change to 85% of their time spent feeding on the moorland.

7.3.2 The diet of golden plover chicks focuses on Beetles and *Tipula* (Crane Fly). Feeding habitat selection of the chicks matches habitat of their prey. Favoured vegetation structure includes Hare's-tail common cotton-grass *Eriophorum vaginatum* mire and soft rush *Juncus effusus* grassland (Whittingham M.J 2001).

7.3.3 Maintaining a diverse vegetation structure on moorland through mixed grazing alongside a cutting or a burning regime is an important aspect of land management for golden plover chick rearing post incubation. A study assessing 85 moorland sites in

southern Scotland found a correlation between productivity and areas of short, open grassland/vegetation swards and this type of land management. (Pearce-Higgins & Grant 2006).

7.3.4 Water table restoration combined with reduced grazing intensity followed by peatland restoration re-vegetating the sward has been carried out at Dove Stone in the Peak District National Park since 2010. The project has been managed by RSPB and United Utilities. Carr and O'Hara (2015) surveyed the population size and breeding productivity of golden plovers in this area between 2011 and 2013. The study found an increase in breeding populations across all three years of surveying within areas under targeted management. During this three-year period revegetation of bare peat was attempted through reseeding techniques as part of a Sustainable Catchment Management Programme (SCaMP). The overall aim of this work was to restore a *Sphagnum* dominated blanket bog. To raise the water levels gullies were blocked using stone and heather bales to produce wetter areas.

7.3.5 Numbers of golden plovers within this Dove Stone 2km² study area peaked at 25 pairs. In comparison the largest number of pairs per km² within the NYMNP during the same period, the 2014 survey, was 10 pairs in survey square number 55, grid reference SE6496 in central Bransdale. In 2019 the largest number recorded in one square was again 10 pairs this time in survey square number 88, grid reference SE9299 on the Fylingdales Moor. The 2024 season saw mixed fortunes for golden plovers. The highest number of pairs found in a km square was 6 within survey square number 30, grid reference NZ7300 on Danby High Moor, and 5 pairs in square 82, grid reference SE8299 on Goathland Moor. Whilst the number of pairs of golden plovers in survey squares 55 and 88 had reduced to two pairs and a single pair respectively.

7.3.6 The survey squares with higher totals from the North York Moors proved to be the rare exception across the surveys in 2014, 2019 and in 2024 rather than a common finding across the whole of the NYMNP study. In the 2019 NYMNP study only eight squares held five or more pairs of Golden Plover per 1km². 61% of squares returned either no pairs or one pair and the overall mean total of pairs per km² was only 1.73 pairs/km². In the 2024 season only two squares held five or more pairs. Over 65% of survey squares returned either zero or one pairs and the overall mean total of pairs per km2 was down to 1.03 pairs/ km².

7.3.7 Land Management Priorities for Golden Plover

- **Incubation Period**: Create and/or manage short sward intensively grazed unimproved grassland rich in invertebrates relatively close i.e. within a few kilometers of the breeding area. This provides sites for adult foraging.

- **Chick-rearing**: Create and/or manage a moorland water table level which encourages a diverse mosaic of blanket bog vegetation containing hare's-tail common cotton-grass, low growing heather *Calluna vulgaris* and *Sphagnum* moss.

7.4 Lapwing

7.4.1 Lapwings have been traditionally thought of as predominantly a breeding wader of lowland England once common in the lowland arable landscape. Most academic studies of breeding lapwings have consequently concentrated on lowland wet grassland habitat. The relatively stable population in the NYMNP study (since 2008) becomes regionally important when considered against the context of larger declines in the lowlands.

7.4.2 The challenges facing lapwings in the uplands however are very similar to the lowlands. Declines have resulted from habitat loss and degradation due to changes in farming practices. Agricultural intensification has been noted as a likely cause of decline in upland areas (Taylor et.al 2004) this can adversely affect lapwings when considering the importance of the wider local landscape for foraging away from the nest.

7.4.3 Lapwings feed on a variety of invertebrates. Habitats such as unimproved rough grazing with a high density of leatherjackets and earthworms are particularly important pre-breeding immediately after lapwings have arrived on the breeding grounds (Galbraith H 1989).

7.4.4 During the breeding cycle, nesting habitat choice has been found to depend to a greater extent on the cryptic colour and structure of the surrounding vegetation rather than the quality of the feeding close to the nest. (Galbraith H 1989).

7.4.5 A study on an upland farm in Stirlingshire in 2012 which had high numbers of breeding lapwings found the in-bye fodder crop management system being used on the farm supported 60% more lapwings than the control site. A system of forage brassica for 2 years followed by grass reseeding was used and produced the highest yield of lapwings in the year after the brassica was sown. The availability of bare ground was found to be critical to nesting site choice (McCallum H.M 2012).

7.4.6 Vegetation management is critical for breeding lapwings whether through grazing or land management such as grouse moors where heather cutting/burning influences the sward length and composition. An association between lapwing declines and vegetation cover was found in a study by Amar et al. 2012. The reduction of breeding birds was found to be greatest on heather-dominated plots and a link between declines and proximity to forest edge was also discovered.

7.4.7 Land Management Priorities Lapwing

- **Pre-breeding and Breeding Feeding:** Create and/or manage short sward intensively grazed unimproved grassland rich in invertebrates especially leatherjackets and worms relatively close i.e. within a few kilometers of the breeding area. The importance of in bye land is well illustrated by the species distribution across the North York Moors.

- **Breeding:** Ensure the availability of a diverse open vegetation mosaic dominated by wet grassland pasture with a low or short structure and/or areas of open bare ground. RSPB advice involves grazing grassland heavily from late summer in order to leave short sward for nesting birds in the following spring. But then reduce stocking levels to prevent egg trampling and eating by the sheep. Short sward during the spring is good for breeding habitat.

- Limit disturbance from all sources involving both people and stock in areas where they are nesting which is frequently on sites with little soil/organic matter on the surface which creates open bare areas on moor top.

7.5 Curlew

7.5.1 During the breeding cycle curlews have a diverse diet of invertebrates, the most important being earthworms, leatherjackets, beetles, spiders, caterpillars and grasshoppers. The precocial chicks feed on insects they find on the ground or on the surfaces of leaves of ground vegetation. Worms are often absent from peaty soils but abundant on mineral soils, especially pasture close to the moorland edge. (Buchanan 2006).

7.5.2 A study in Sweden in 1992 found a very similar change in feeding patterns occurs with curlew to lapwing and golden plover. Grassland (in this case agricultural sown fields) was found to be significant for feeding during pre-breeding. Later in the breeding season foraging occurred closer to the nest site at the best fields for food rather than lower value fields further away. The link in this study was made between the preference for closer feeding areas and reduced risk of nest predation. (Berg A. 1992).

7.5.3 Risk of nest predation on breeding waders has been studied by many authors. One interesting study on curlew nesting risk and breeding habitat selection was researched in relation to the presence of kestrels on a site in western Finland. The study found that curlew nests were closer to kestrel nests than expected. The loss of chicks through kestrel predation was less than corvid predation and the conclusion was made that the association was a positive one guarding against higher predation by other predators such as corvids (Hemminki et.al. 1995).

7.5.4 Curlews nest on the ground and favour gently sloping land which provides good visibility around the nest site. They also prefer taller vegetation typical of damp habitats such as grasses and rushes. A preference for vegetation with a varied structure is shown as opposed to the shorter sward utilised during breeding by lapwing and golden plover. Typical sward often includes tussocks formed by species such as purple moor-grass *Molinia caerulea* on damp soils (Haworth & Thompson 1990).

7.5.5 Challenges for curlews in the uplands include:

- fragmentation of habitat often caused by a reduction in areas of 'natural' unimproved grassland

- Drainage of wet flushes.
- New woodland planting can also have a negative effect on breeding curlews by creating increased enclosure of suitable habitat.

Guidance for the assessment of breeding waders and woodland schemes can be found on the Gov.uk website.

7.5.6 Do agri-environment schemes deliver for curlews? Their home ranges and habitat use are more complex than once thought. Remote tracking studies utilising GPS data have shown that breeding birds can travel long distances to forage. Also, a significant proportion of the population have been found to be non-breeding birds (Bowgen et al. 2020).

7.5.7 Land Management Priorities for Curlew

- **Pre-breeding:** Create and/or manage unimproved grassland rich in invertebrates relatively close i.e. within a few kilometers of the breeding area.

- **Breeding:** Create and/or manage habitats on or close to the open moorland on damp soils which contain a mosaic of vegetation communities and structures from taller grassland and heather *Calluna vulgaris* through to shorter unimproved grassland rich in soil invertebrates.

- **Water Levels:** Maintain wetter areas, even shallow pools, to provide insect rich feeding areas for chicks. Hay meadows, with a greater diversity of grasses and flowering plants, are also important feeding sites for both adult and juvenile curlews. Cutting and harvesting of such grasslands should be delayed until after the breeding season.

7.6 Snipe

7.6.1 Snipe have traditionally been associated with marginal land containing wet grassland and many research papers have shown the link between these specialist habitat requirements and breeding success. A particularly valuable study was undertaken on an upland moor near Barnard Castle in Teesdale on behalf of the Game Conservancy

Trust between 2000 and 2002. The results showed a strong association with marshy grassland or acid flush habitat with flush rates 3-4 times higher than on drier heath. (Hoodles S. et.al. 2007).

7.6.2 The proximity of small areas of wetland such as small pools and runnels or ditches is also an important factor in snipe habitat choice. In the Teesdale study vegetation with an uneven structure was also found to be favored. Preference for types of tussock vegetation such as rushes (Juncus) and grasses (Hoodles S. et.al. 2007).

7.6.3 High water levels providing surface moisture to allow snipe to probe the soil with their long bill for food is critically important for breeding success. The longer this wet/soft ground is available throughout the spring and summer the better snipe can cope with pressures such as predation and trampling of nests by stock. Moist soils allow the breeding season to continue for longer which in turn allows replacement clutches to be laid by breeding females and a subsequent higher breeding productivity (Green R.E 1988).

7.6.4 Snipe diet consists of a wide variety of invertebrate prey. The Teesdale study found that 85% of the food taken during the breeding season was earthworms and tipulid larvae. Differences in seasonal diet were found to be significant and included a higher percentage of aquatic and surface invertebrates taken earlier in the spring changing to a higher tipulid content later in spring. However, throughout the breeding season earthworms remained the strongly favoured food item, the chicks are largely fed on this diet sourced near the nest site (Hoodles S. et.al. 2007). Traditionally higher water levels early in the spring may lead to a preference for aquatic and surface food types.

7.6.3 Land Management Priorities for Snipe

- **Breeding:** Create and/or manage habitats on the open moorland or on in-bye land on damp soils to favor marshy grassland and acid flush habitat in a mosaic of unimproved land rich in soil invertebrates. This can be achieved by avoiding new drainage schemes and blocking existing grips and field drains. Reduce stocking levels.

- **Water Levels:** Manage water levels to ensure a higher water table throughout the spring and summer periods thereby prolonging the period during which snipe can probe the soil and cope with additional pressures such as nest trampling by stock and predation.

7.7 Land Management Summary

7.7.1 All four species of breeding waders have a combination of species-specific habitat requirements combined with generalist requirements which are a common factor in breeding habitat choice.

7.7.2 One critical habitat requirement which is common to all four species is the importance of optimum feeding habitat prior to breeding. This critical time when waders arrive back from their long migration is a time when enclosed grassland fields, in-bye land and/or moorland edge areas with high numbers of invertebrates are essential to enable females to get into egg laying condition and males to defend a breeding territory.

7.7.3 This requirement for nearby areas of high food productivity away from nesting sites underlines the importance of applying all land management options for breeding waders within a landscape approach system. Habitat network planning should therefore incorporate moorland nesting habitat within a larger landscape area encompassing several kilometres surrounding the nest sites where the availability of unimproved land is critical to breeding wader productivity. Traditional sites are often used by waders in the NYMNP pre-breeding. A range of grazed grassland fields across the area regularly contain flocks of golden plover in early spring. A good example are the fields at Turnhill Rigg on Hamer Moor above Rosedale Abbey. Appropriate management of these and other similar fields to ensure a continued supply of short sward grassland with a high population of soil invertebrates is critical to ensuring the local population of golden plover and other waders are conserved.

7.7.4 Land management options such as stocking density control to ensure tight winter and early spring grazing to produce short sward grassland should be combined with incentives to ensure these fields are managed in an unimproved system with a view to creating invertebrate rich soils. Cattle have been found to be better providers of invertebrate rich dung than other grazing animals such as horses, however worming

using Anthelmintics has been shown to have a significant negative effect on the abundance of soil invertebrates (Rendells 2024).

7.7.5 Many waders arrive in early March to breed on the North York Moors. A fledged golden plover chick was photographed on the 2nd May 2014 by R. Baines whilst conducting the NYMNP wader surveys in the Kildale area. Incubation normally takes up to 31 days in golden plover. Allowing for egg-laying (2-3 days) and time to develop a pair bond and nest site prior to this, the start of breeding for this pair is likely to have been mid-March. Disturbance to breeding areas from early March is therefore likely to have a negative effect on wader numbers.

7.7.6 Water level control or restoration to restore wet blanket bog habitat and/or manage in-bye land is critically important to all waders especially golden plover and snipe. The Dove Stone project proved the value of revegetating bare peat within the SCaMP project, combining this with raised water levels, gullies blocked, and stone and heather bales used to restore *Sphagnum* dominated blanket bog.

7.7.7 The excessively wet winter and spring of early 2024 undoubtedly led to challenging times for breeding waders in the NYMNP. This was in pronounced contrast to the exceptionally dry spring of 2019. The moors however quickly dried out and by June we headed into a long period of well below average rainfall. With the vagaries of Climate Change, it is even more important than ever to ensure a sustainable source of water is held within the uplands. Land management strategies to hold water on the hills during wet weather will help ensure habitat is available for returning waders in early spring and importantly throughout the breeding season. The peatland restoration results (see 4.5 page 29) show clear evidence of the benefits to waders of this habitat enhancement strategy.

7.7.8 A small number of squares within this study have traditionally returned poor results for waders. In many cases this is due to a combination of excessive slope, proximity to forest (enclosure) and/or the unsuitability of vegetation structure for waders. In these where a change in constraints to waders are unlikely to change, it may be wise to reconsider alternative management strategies. A change to management for other declining species e.g. songbirds such as whinchat, redstart and ring ouzel would be a logical approach.

7.8 Site Photos

7.8.1 The following selection of photos taken on survey dates show a range of conditions and habitat types.

Photo 1 – Square 8 NZ6108. Warren Moor Kildale. First of two photos showing the importance of a mosaic of moorland, rough pasture and inbye land adjacent to each other. Lapwings and curlew were utilising all three habitats in this square. Lapwings breeding on adjacent improved grassland and on the high moor. Photo taken 5th April 2024.

Photo 2 – Square 17 NZ7303. Hart Leap. Adjacent moorland and old pasture/inbye land. This area was full of birds especially snipe with many singing birds in the adjacent rush pasture just south of the square. Lapwings and curlew feeding on adjacent sheep grazed pasture with a small number of pairs nesting on the moor. Photo taken 8th April 2024.

Photo 3 – Square 13 NZ7505. Low Moor Busco Beck. A productive area for curlew with five pairs. A good mosaic of wet rush pasture, grassland and adjacent heather moorland. Photo taken 8th April 2024.

Photo 4 – Square 18 NZ6502. Pie Thorn an abandoned inbye area in foreground of photo. Majority of area beyond Pie Thorn is unsuitable for breeding waders due to the steep slope. Old abandoned inbye land in foreground held up to three pairs of curlews. Photo taken 23rd April 2024.

Photo 5 – Square 24 NZ7201. Glaisdale Moor. 2024 was a bumper year for cotton grass growth due to the very wet spring. This square held three pairs of curlews and four pairs of golden plovers. Photo taken 11th June 2024.

Photo 6 – Square 30 NZ7300. Bluewath Beck. First survey visit. High water table to due wet spring conditions created many small pools. Open moorland with two pairs of golden plovers on 11th April 2024.

Photo 7 – Square 30 NZ7300. Bluewath Beck. Second survey visit. This area had retained many small pools into June with less drying than other areas of high moor. The most productive square for golden plover with six pairs on second visit 12th June 2024.

8.0 SURVEY RECOMMENDATIONS

8.1 The results and evaluation of the 2024 survey show varying trends across the four species of breeding waders since the surveys first began in 1996. Long-term studies provide the best source of producing reliable data on changes in bird populations. The value of this survey therefore increases the longer it is carried out. There has been some variation in timing of the surveys through the 28 years with the intention to survey every 4-5 years often depending on funding opportunities but overall, the surveys have taken place at an average of a survey every 4.5 years. To enable consistency of timing the next survey should be carried out in 2028 or 2029.

8.2 More detailed studies looking at the relationship between habitat differences have the potential to be extremely valuable in relation to the success of restoration projects such as the NYMNP peatland restoration program. An additional specific study on the spatial distribution, productivity and population of breeding waders on the peatland restoration areas compared with control plots within the same area would be a very valuable research tool to evaluate the success of habitat improvement works.

8.3 The habitat condition of each square surveyed influences the bird populations in that immediate area. The evaluation and recommendations on land management would therefore be stronger if a habitat survey had been conducted either alongside this study or in a more limited annual wader population study (see below).

8.4 Monitoring a smaller number of survey squares annually would be a good way to track trends and create a mechanism where conservation action could be taken quickly based on results over several consecutive years. This may be a good way to tackle adverse effects of climate change on wader populations happening on a rapid scale. An annual survey of a statistically relevant number of wader squares may provide a better understanding of longer-term trends and allow speedy conservation action to reverse any decline detected.

8.5 Recording additional species has proved to be very productive especially in relation to meadow pipits. The fall in productivity detected in 2019 and an even bigger decrease in 2024 is alarming. It is straightforward to include meadow pipits in this survey method therefore they should also be included in regular smaller scale wader studies between the full survey years.

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10.0 APPENDICIES

Appendix 1 – Plan of the 92 x 1km squares covering the moorland area of the NYMNP (provided by NYMNP Authority)