The Impact of Deer on Wetland Habitats in the Broads National Park

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1.1 Origins and Context

There are growing concerns about the impact of deer on Broadland wetland habitats, particularly fens but also wet woodlands and to a lesser degree, wet grassland. These concerns centre around direct damage to habitats and surface peats, damage to infrastructure in wetlands and secondary impacts on the ability of landowners to manage their sites.

Deer numbers are thought to have increased in recent years. RSPB (2024) summarise: "The rapid increase in the deer population is due to increased protection under the Deer Act 1963 ….. and change in habitat structure including increased woodland cover and winter crops (Putman and Moore, 1998), which provide deer with food and shelter all year round." The trend for larger populations – and increasing damage to sites – is likely to continue without intervention. Note that only Red and Roe Deer are native to the UK; Red deer in Broadland are mostly introduced.

Concern regarding damage to crops on fields surrounding Broads wetlands has also been increasing. This has stimulated more deer control programmes, although land managers consider fens in particular as deer refuges, making the control measures more difficult and less effective.

A broad grouping of landowners and site managers, under the umbrella of the Broads Biodiversity Partnership, now feel a review of evidence is needed on which to consider deer management options, and to develop monitoring methods which can be used to track change in deer impacts.

In their brief for the contract, Broads Authority summarise the context for this work:

> "The Forestry Commission, working with the Broads Authority, commissioned a drone survey to determine deer populations across 203km^2 across the Northern Broads. The details of the survey and further background are here: Deer surveys (broads-authority.gov.uk).
>
> This review of evidence will quantify the environmental impact on designated fen, reedbed and wet woodland habitats, of the recently surveyed deer population. The report will provide recommendations for future monitoring.
>
> [The report should describe a] strategic approach to assessing the impact of deer on conservation priority habitats in and around the Broad National Park to be undertaken on behalf of the Broads Biodiversity Partnership."

1.2 Types Of Deer Impact on Wetland Habitats

In this report three main types of deer impact have been highlighted by stakeholders:

- **Grazing:** offtake of vegetation as part of the dietary requirement of the deer. Deer will graze the full range of vegetation found in the Broadland habitats, although grazing preferences can switch between seasons (according to availability and nutrient content) and between deer species. Putman (1986) showed this in some detail for deer species and habitats of the New Forest, Hampshire. The studies have limited applicability to Broadland as the species and the habitats are mostly different, and there was likely to be some moderation of deer grazing by interaction of other grazers such as the cattle and New Forest Ponies. There has been no similar study in the Broads.
- **Browsing**: essentially a specialist sub-set of grazing, browsing refers to cropping of woody growth (brambles, roses, woody shrubs and trees) at any level accessible to the deer. Browsing can affect rooted stems and scrubby growth, or can remove branches in which case a browse line can be distinguished.

Both grazing and browsing can have negative and positive impacts depending on the intensity and the cropped species.

- **Physical damage**: This refers mostly to trampling and creating large wallows, but also to damage caused by large individuals or groups breaking down barriers and fences when moving through the landscape. Trampling can cause direct damage to plants, with ground growing bryophytes and small fen species especially vulnerable, or trampling down of fen vegetation in areas of intensive use. Trampling on soft wet sites can cause break-up of the surface vegetation mat and the mashing and destruction of surface peat. On regular movements routes, trackways form which with heavy use can lead to development of deep trenches which provide barriers to machines and people, impacting site management. Creation of open trackways through otherwise dense fens can potentially open access routes for predators. Large herds can damage physical infrastructure such as sluices, fences, earth bunds, bridges and boardwalks.

1.3 Racks and Tracks: Note on Terminology

In their literature, the Forestry Commission use the term “Rack” for the tracks made by deer. In this report, the term track or trackways is used because that is the terminology used across the Broads. The two terms are synonymous.

1.4 Project Aims

The Brief describes three principle aims of the work:

1. Collate and review evidence.

2. Review the monitoring methodology of the impact of deer across the Broads National Park designated site habitats, with a focus on fen, reedbed and wet woodlands.
3. Test the monitoring methodology on a selection of Broads sites.

2. Evidence From Published Sources

2.1 Impact of Deer On Adjacent Land Use

2.1.1 Agriculture

Deer are essentially herbivores and browsers, often with a large body mass. In large numbers they can have a significant impact as grazers on arable crops, particularly grass crops such as barley, wheat and rye. The impact of deer grazing on arable crops can be marked and visually very obvious, although perhaps not always easy to separate from similar impacts from rabbits. Winter grazing of autumn-sown grains is not a particular problem (winter grazing with sheep was a traditional practice thought to be potentially beneficial to crop establishment), but grazing in spring and summer directly suppresses crop yields. This has been reviewed in Putnam and Moore (1998).

Grazing of broadleaved crops such as sugar beet and oilseed rap is less well understood but may still be significant. Some landowners have observed deer eating beet roots.

Local landowners suffer significant economic damage attributable to deer. There are crop losses due to deer droppings resulting in rejected grain harvests, as well as direct damage by deer lay-ups and grazing. Concerns are sufficient to have initiated deer management focused on population reduction. These activities are concentrated on agricultural landscapes surrounding floodplain habitats as the latter provide refugia for deer populations.

Watson et al (2009) note that deer can be vectors of disease with bTB being the main concern. Deer have to be at a very high density to promote spread of TB to stock (see below) but the risk remains for grazers in the Broads. Blue Tongue is a notifiable disease which can be fatal to stock (Bluetongue: how to spot and report it - GOV.UK) and can be carried by deer. East Anglia is part of the Bluetongue Restriction Zone (APHA Interactive Bluetongue Virus Map).

2.1.2 Gardens and Other Land Uses

Deer damage in gardens and other private land can also be significant. Small numbers of deer can wreak havoc in unprotected gardens almost overnight. The cost of deer fencing gardens is often prohibitive for house owners and the fences themselves unsightly so close to home. In response to calls for evidence for this project, local landowner James Paterson states “….we have an area which ……. is an old water garden that over the last 15 years we have tried to re-establish the trees and shrubs that would have been before the area was clear felled in the 1960s …..The project has been abandoned due to the deer damage – mainly reds – which can only be kept out by full deer fences…” by email 14/11/24.

2.1.3 Roads and Infrastructure

As deer numbers increase, frequency of contact with infrastructure increases. The issue of deer on roads is especially acute (Nelli et al 2010). Deer are increasingly bold and unafraid

and can often be seen grazing grassy road margins, even on the larger dual carriageways. Muntjac are most frequently seen.

The issue is road safety. Cars swerving to avoid impact can lose control and be a danger to themselves and other road users. Deer impacts are dangerous, can cause severe damage to cars and cause trauma to drivers. Injuries to animals not killed outright at impact are common.

As deer densities increase, the hazard of deer on roads increases in parallel. This has been reviewed in detail by Putman and Langbein (2024). Factors found to increase deer collisions by Nelli et al (2010) are high traffic flows, rainfall and presence of a mosaic of woodland and suburban development. They found that various strategies to reduce impacts such as warning signs, road fencing and under- or over-passes have limited effect.

2.2 Defining Thresholds of Deer Density Which Result in Damage

Watson et al (2009) reviewed the data and considered defining thresholds of deer populations at which damage started to occur for different themes. They summarise the influence of species on behaviour and potential damage:

> "The impacts of different species of deer depend on three things – relative biomass, feeding strategy and social organisation. We can distinguish at a basic level between selective foragers such as roe deer, muntjac and Chinese water deer, and species such as red, sika and fallow which have a tendency towards a more bulk-feeding strategy. Coincidentally, this split between the species also applies to social organisation and relative body size: with the larger-bodied red, fallow and sika deer, also tending towards larger group sizes and being more mobile over a larger home range, in comparison to the comparatively solitary habit and restricted home range of species like roe and muntjac. Given the differences in ecology and behaviour between these two broad groupings of deer, we may expect different density thresholds to apply to the two groups, above which impacts may become damaging or unacceptable."

Definition of threshold populations is made more complex by potential interactive and in-combination effects of different deer species and groups. This would clearly apply in the Broads, where there are significant complexities introduced by a range of habitat and context factors such as site conditions; landscape mosaic (availability and juxtaposition of different habitats in the wider landscape); availability and quality of alternative natural forages, and the juxtaposition of forage and cover habitats.

Consequently, they caution "…even in relation to one given context we should not expect to find a single fixed threshold above which negative impacts may become significant." Instead of a fixed density threshold, they suggest a range of densities at which damage might occur.

They recommend that exceeding these population thresholds should be a trigger to further investigation rather than a trigger for population control. Only when population level and impacts on habitats or features have been clearly linked should control take place. Their approach is therefore one of caution, and evidence.

Table 1 summarises the densities at which damage starts to occur, according to their review of the literature.

Clearly, large deer have an impact at much lower densities. Many cells in the table have undetermined thresholds, but in general, 4-10 large deer per km^2 or 25-50 small deer per km^2 seem to be broad thresholds for impact.

Overall, because of the complexities and uncertainties involved in determining thresholds, and because of the difficulties of accurately censusing deer populations (especially at the landscape scale), they conclude a better approach to deciding on whether to undertake deer management is to assess impacts on the feature of interest rather than rely on deer density. They suggest a RAG rated decision matrix, but it refers mostly to other guidance

Table 1. Densities of deer (deer km^2) at which damage has been reported in literature reviewed by Watson et al (2009). ND = Not Determined

Deer Group	Agriculture	Forest Damage	Natural Regeneration	Coppice	Ground Flora	Insects, Birds	Moorland	Livestock Diseases	Vehicle Collisions
Red, Sika, Fallow	ND	4-5	4-5, 14	ND	ND	1 (butterflies) 8 (bird diversity	7-8	25 Fallow >90 Red	7
Roe, Muntjac	ND	ND	25	25	50	ND	ND	26	ND

2.3 Deer Numbers in Broadland

In February 2024, a thermal imaging survey by drone was undertaken in the Thurne, Ant, Bure and Yare catchments for the Forestry Commission working in partnership with the Broads Authority (BHW 2024). The survey area was 203.5 km^2, with the results summarised in Table 2.

Table 2: Summary Results of a Deer Survey in Northern Broadland, February 2024. From BHW (2024).

Species	Total Count	Density per km^2
CWD	1,571	7.7
Muntjac	755	3.7
Roe	185	0.9
Red	934	4.5
Total	**3,445**	**16.9**

Mean densities across the survey area are just within the trigger threshold for Red and mid-range for CWD. They are much lower than the suggested trigger thresholds for Muntjac and Fallow. However, Table 2 will underestimate localised deer impact. Deer do not occupy the area evenly but cluster at higher densities either according to habitat type or by daily movement patterns.

BHW point out the data from the Norfolk survey should be considered an absolute minimum because:

- Deer numbers in February are close to the annual low after culling and winter, but before summer recruitment.
- The total area included large areas likely to be devoid of deer, such as the lakes or developed land. Density in habitats of interest was likely to be substantially higher.
- Diurnal movements of deer - leaving open habitats to take cover in fens in the day – means actual densities would be much higher in specific habitats when they were in use.

These caveats explain why deer censusing is both difficult and of limited value in establishing thresholds for interventions. The data confirms that a better focus for making management decisions is assessing damage.

In terms of individual deer species, the survey shows:

> **Red Deer.** Reds were recorded in large herds in woods and marshes, in the northern catchments, but not recorded in the Yare. There was a particularly dense belt of Red sightings centred around Sutton, Hickling and Horsey wetlands. There was a large group around East Ruston, but none recorded at Calthorpe Broad. Red deer were observed moving from arable to fen in early morning for cover.

Chinese Water Deer (CWD). Clearly the most abundant species, especially in the fens and marshes in the southern catchments. In places over 100 CWD/km^2 were recorded, well above any of the densities triggering damage recorded in Table 1, and according to BHW the highest density ever recorded in the country and "…possibly the world."
Muntjac. High densities in woodland and hedgerows throughout the study area. Probably under-recorded because of the thick under-storey they prefer.
Roe. Generally low numbers, mostly in woods, hedges and arable fields in the north. Rarely in the marshes and fens.

2.4 Impacts of Deer on Wetland Habitats

2.4.1 Impacts on Fens and Reedbeds

The most directly relevant study is RSPB (2024), which assesses impacts of deer on reedbeds at Leighton Moss, Lancashire. Deer were known to have increased significantly in recent decades (a combination of Red and Chinese Water Deer), while Bittern breeding success had declined. The study investigated a possible correlation between the two.

To assess deer usage of reedbeds, RSPB measured the density of deer tracks visible on aerial photos in different time periods, digitising tracks on GIS. Table 3 shows the change in such tracks over time for the whole site.

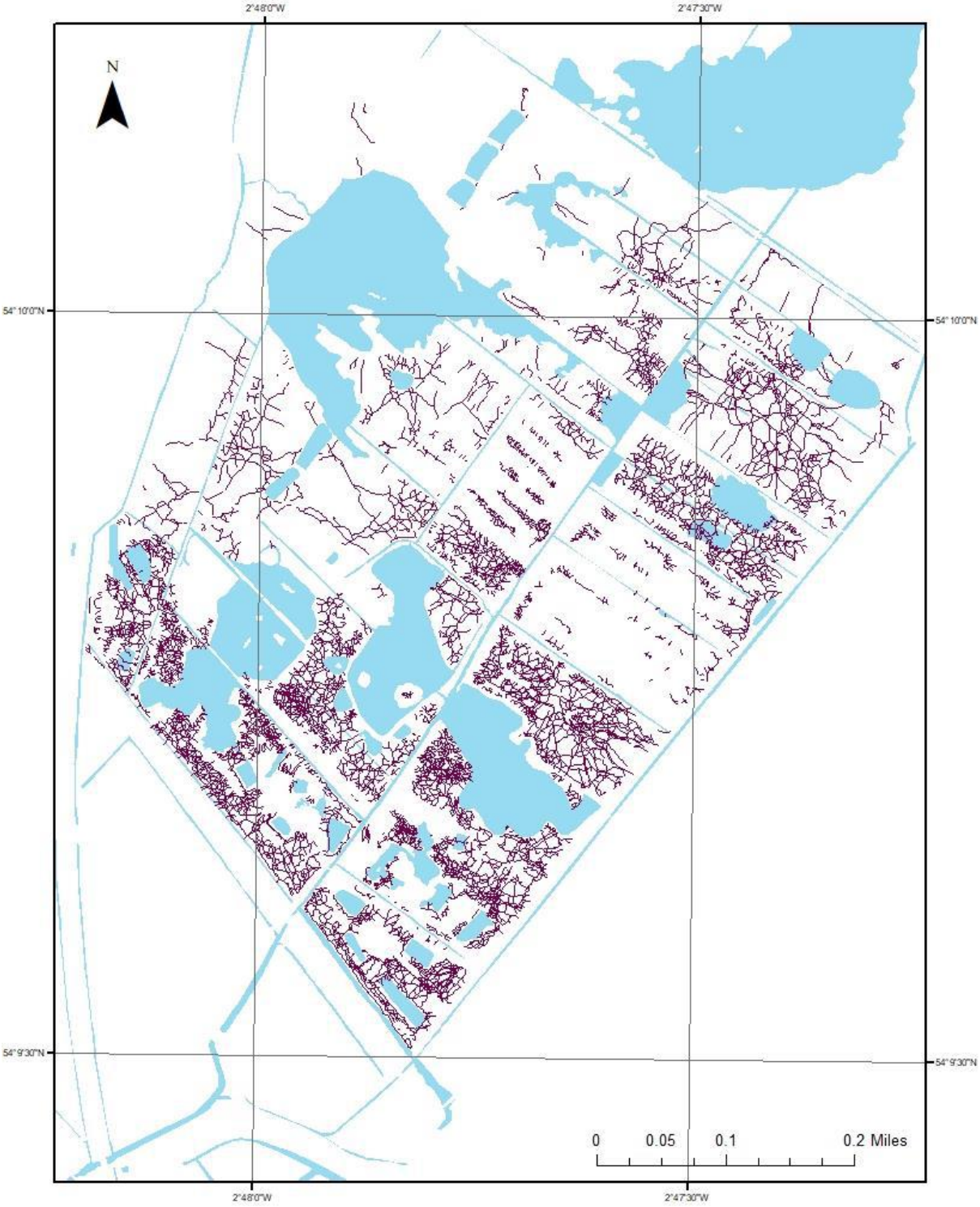
Table 3. Total deer track length at Leighton Moss digitised from four aerial photos. From RSPB (2024).

Year	Total Deer Track Length (m)
1988	14, 825
2002	48, 960
2014	61, 216
2017	17, 398

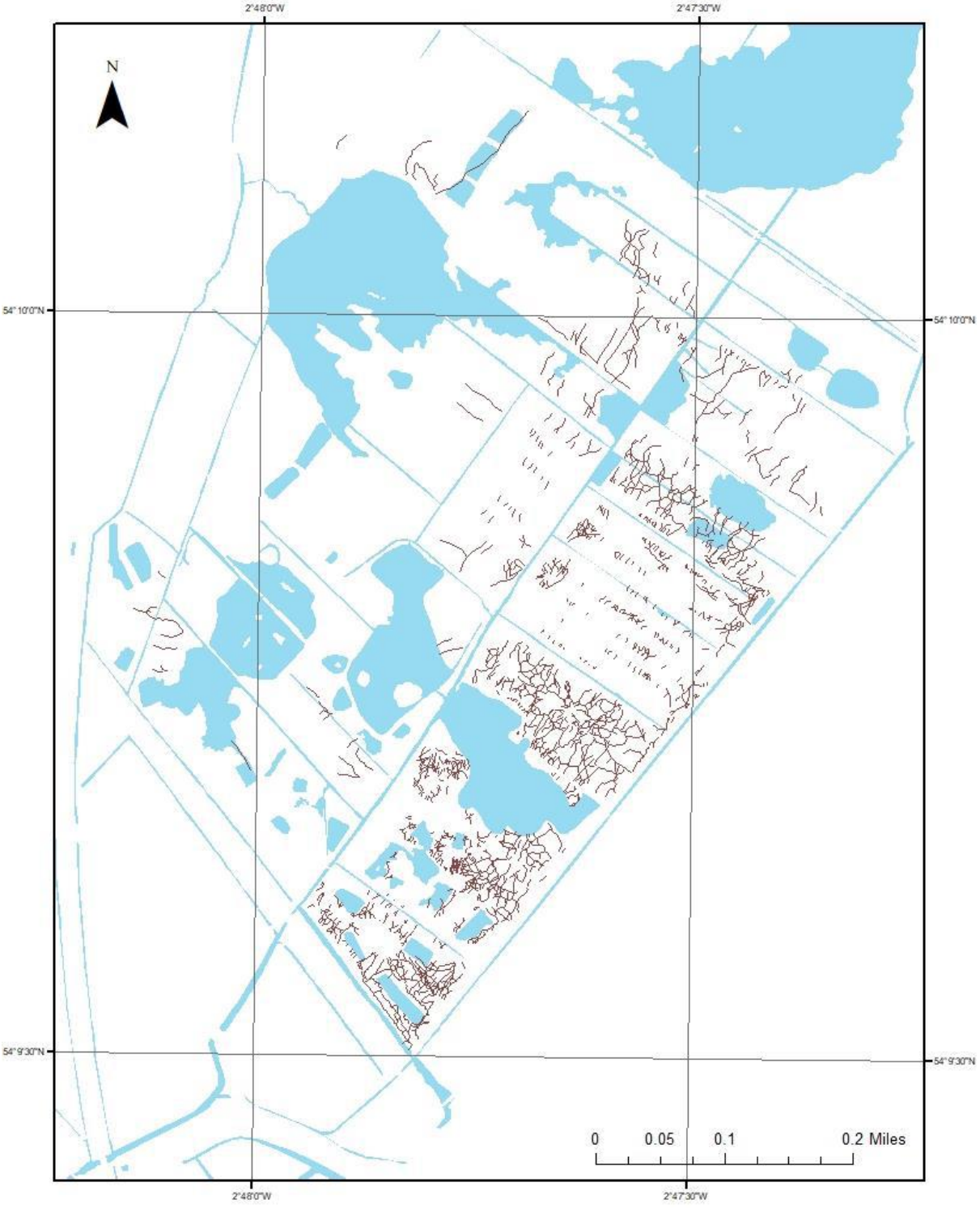
There was a steady rise from 1988-2014. The sudden drop in 2017 is due to deer management interventions after 2014, principally but not exclusively culling. Culling may have affected deer use through direct reduction in numbers and also by deer perceiving danger and avoiding reedbeds (a predator response strategy). Figure 1 shows the effect of control on deer tracks on the site. High visitor numbers along footpaths and reserve management activity could have a similar effect. The suggested impact on behaviour was speculative and not tested in the research.

Figure 1: Deer Tracks Mapped at Leighton Moss by RSPB in 2014 (top) and 2017 (bottom). Deer Culling was introduced between the two surveys. Courtesy RSPB.

2014



2017



Monitoring plots showed the impact of deer on reed growth, comparing (a) plots with no deer tracks, (b) plots with medium impact (1-300m track per 2000m^2 or 1-1500m/ha) and (c) plots with high impact (>300m tracks per 2000m^2 or > 1500m/ha). Areas with high impact had:

- Reduced reed cover
- Reduced reed height
- Reduced reed dominance
- Reduced numbers of flowering heads
- Increased “lawned” areas, i.e. areas which were open and grassy.

Most of these factors degrade quality of habitat for Bittern which need large expanses of tall, dense and vigorous reed (see Gilbert 2005). RSPB note Bitterns only nest in blocks of reed which exceed 100m at their narrowest point, a criterion easily breached by frequent lawns or dense networks of wide tracks. Other reedbed specialists can be affected, such as Bearded Tit which are dependent on an abundance of healthy reed flowering heads. RSPB (2024) suggest the damage was principally attributable to grazing of the reed, although this conclusion was not supported by observational studies.

Note that RSPB found the above metrics were only affected in high impact areas, >1500m/ha. Those in medium impact areas were not significantly affected, suggesting there is an acceptable level of impact. This acceptable trigger level was not identified and would require further work. It is probably species-specific, and possibly also site-specific because the character of reed growth will vary between sites even without the influence of deer. Hence defining “acceptable” deer track density would be a complex and research-intensive issue.

A limitation of the research is that only three Plots were used, one in each impact class. It was difficult to control other variables that affect reed growth, particularly hydrological regime and nutrient levels. Other factors such as management of the reed and the degree of leaf litter in the reedbed are also important factors which were not controlled.

In fact, RSPB used management of other factors to mitigate damage by deer. Water levels were drawn down to a maximum of 20-30cm above ground level to help oxygenate the marsh surface, increasing oxidisation of leaf litter. Winter cutting of reed was increased. Both factors increase the density and vigour of reed. The combination of culling and amended management are thought to be responsible for reduced impact of deer on reed and subsequent recovery of Bittern nesting performance.

The research very clearly identifies impacts attributable to deer, correlates this to decline in a key feature of the habitat and documents the recovery of that feature following deer management. It also demonstrates the importance of site management in mitigating impacts. However, the study was not sufficiently comprehensive with enough controlled replicates to define a trigger point in deer track density. The study did not look at other factors of interest such as damage to peat or other habitat attributes and was restricted to dense reedbeds.

By contrast, Park (2018) looked at the association between deer tracks and the colonisation and dispersal of Fen Orchid, *Liparis loeselii* in the Catfield and Sutton Fens, Broadland. Park mapped the deer tracks in one compartment at each site, recording 5,137m at Sutton Fen and 2,592m at Catfield Fen. She found at both sites that Fen Orchid clumps were in closer proximity to deer tracks than would occur by chance. At Sutton Fen, close proximity to a deer track was significant, but the relatively low level of use by deer suggested the orchid was not being dispersed directly by the animals. Rather, it was the presence of the track that facilitated dispersal, perhaps by opening corridors of preferential wind or water distribution. At Catfield Fen, the reverse was the case, where orchid dispersal was only correlated with level of use by deer, suggesting they were the agents of dispersal, on hooves or fur. Of course, dispersal may also occur from other animals using the deer paths, such as otters or foxes.

Comparing her results with RSPB (2024), Park's track density at Catfield was 1,535m/ ha, and at Sutton track density was 1,385m/ha of fen. This places them on the boundary between moderate and high impact categories.

It is likely that other plant species benefit from similar dispersal mechanisms as Fen Orchid seems to have done.

2.4.2 Impacts on Wet Woodland

There were no studies of impacts of deer on wet woodlands or scrub characteristic of Broadland. This may in part be due to the difficulty of accessing such woodland. Because we cannot access these often-treacherous terrains, should not imply deer cannot. Some evidence from the Broadland questionnaires suggesting wet woodland can be a key habitat for deer. However, they may find the wettest quaking swamp woodlands too much even for their abilities.

In Broadland, much wet woodland grades to damp and then drier woodland types. These transitions are an important part of the conservation interest. Although much of the research regarding deer and woodland took place on drier types it can be assumed similar impacts are experienced by most Broads woodland.

Deer are widely understood to have significant impacts on woodland, principally:

- Browsing of young shoots whether seedlings, maiden saplings or coppice regrowth. This can prevent natural regeneration of woodland and kill coppice.
- Preferential grazing of species (documented in for instance in Puttman 1986) can affect woodland composition over time. It may explain the recent apparent increase in holly in woodland, this species being avoided by deer.
- Grazing of understorey species such as brambles and roses, or coppice regrowth, has removed whole structural layers. Dense understorey is important as habitat for a wide range of breeding birds and invertebrates.

- Grazing of woodland groundflora can impoverish herb species-richness and through grazing responses, promote grassy or rushy grounds over broadleaved herbs and ferns.
- Wholesale habitat change can rapidly lead to changes in associated faunal communities.

There is little doubt now of the impact of deer on woodlands, sometimes forcing either expensive fencing and culling programmes, changes to woodland management or abandonment of management schemes. For reviews of these subjects, see Putman (1986), Holt et al (2001), Cooke (2007, 2009), Gill and Beardall (2001), Putman and Moore (1998).

Cooke (2009) used a range of indicators to assess the level of impact on woodlands. These are shown in Table 4 as a list in column 1. Impacts are assessed by the degree to which the indicators are changed, and in most cases require quantitative assessment. Cooke notes that this assessment was set up for species-rich conservation woodland on typical dry East Anglian soils, and was developed particularly to assess impacts of Muntjac mostly in coppice woodland. The indicators could be adapted to different attributes more relevant to wet woodland.

Table 4: Framework for Assessing Impacts of Deer on Woodland. From Cooke (2009)

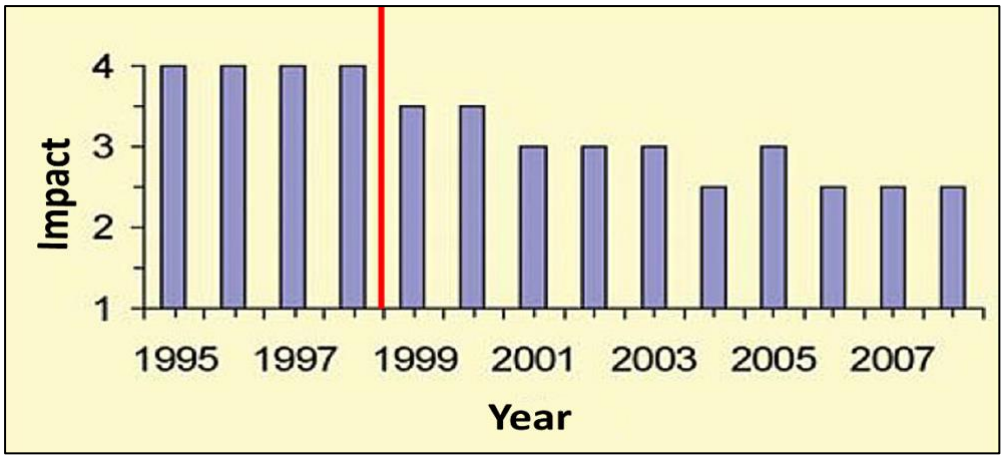
A framework describing effects on woodland indicators at four different stages of deer impact. Numerical data are proportions except where otherwise indicated.

Indicators	Stage 1	Stage 2	Stage 3	Stage 4
Unprotected coppice regrowth	Nil	Stem loss < 0.5	Stem loss > 0.5	Severe stem loss + death of stools
Tree regeneration	Nil	Possible minor effects	Affected	Little/no regeneration of some species
Shrub layer	Nil	Possible minor effects	Affected	(Virtually) eliminated
Browselines	Nil	Nil or on occasional stems	Obvious on some species, signs of general one	General one throughout wood
Stem breakage	Nil	Nil to rare	Occasional	Frequent and conspicuous
Fraying	Nil	Rare	Occasional fresh fraying, much more old fraying	Fresh and old fraying frequent
Ivy browsed day 1	0-0.10	0.11-0.30	0.31-0.60	0.61-1.00
Ivy defoliated day 7	0-0.20	0.21-0.60	0.61-0.90	0.91-1.00
Ground flora	Nil	Possible minor effects	Some species affected	Some species (virtually) eliminated
Grazing on bluebell leaves	0-0.05	0.06-0.15	0.16-0.40	>0.40
Grazing on bluebell inflorescences	0	0.01-0.05	0.06-0.20	>0.20
Grazing on oxlips/primroses	0-0.10	0.11-0.30	0.31-0.80	>0.80
Grazing on dog's mercury stems	0	0.01-0.05	0.06-0.20	>0.20
Height of dog's mercury (cm)	>25	>25	21-25	Up to 20

If these surveys are repeated, they can be used to monitor changes in levels of impact. Cooke (2009) did so for Monks Wood in Cambridgeshire (Figure 2), demonstrating clearly

the impact of deer culling, which started in winter 1998/1999. The surveys can also be used to determine a threshold for action which is based on actual changes to a habitat, rather than deer density.

Figure 2: Changes in Level of Impact following Introduction of Culling in 1998/1999 (red line) at Monks Wood, Cambridgeshire. From Cooke (2009).



Cooke's work has been further developed and issued as Guidance by the Forestry Commission (2023). This provides advice on how to set up and conduct surveys and retains Cooke's four-point scale of impact as:

1. None or minimal
2. Low
3. Moderate
4. High

It is, however, still based on dry or typical woodland, not wet woodland.

RSPB Reserves Department drew up their own deer survey format c. 2008/9. This uses stops on a walk to observe signs of deer activity and deer impact, but the survey records only presence/absence of attributes. It derives a score but not damage classes and cannot be related to the Cooke/FC methodology.

2.4.3 Impacts on Wet Grassland

No published information on the impacts of deer on wet grassland was found during this study.

Deer, especially in large herds could apply significant grazing pressure to grassland. There could also be mechanical damage to paths and infrastructure such a gateways and dyke crossings, although many grass marshes are on mineral soils and less vulnerable to poaching. However, because wet grasslands are already grazed, these impacts are often masked by or confused with impacts of cattle grazing. Separating out the in-combination effects of cattle and deer may be particularly difficult.

3. Stakeholder Survey of Deer And Their Impacts In Broadland

3.1 Deer Impact Survey

In November/December 2024, a questionnaire was circulated to site owners, managers and others observing deer in Broadland, asking for information on deer and their impacts on Broadland habitats. Respondents were also asked about the effects of deer on site infrastructure, about the costs of remedial measures undertaken, evidence of positive impacts of deer on species and habitats, and the monitoring undertaken on their sites. The survey form is provided in Appendix 1. Sixteen questionnaires were returned, plus additional information submitted by email.

Most of the questionnaires related to the Ant and Thurne catchment sites, a few from the Bure and Yare, none from the Waveney. There were very few returns from reedbed managers, most sites were species-rich fen sites although some reed habitat would be included within them.

The information was summarised in an Excel spreadsheet. The following analyses the responses to enable some conclusions to be drawn.

3.2 Deer Recorded

The main species recorded were Red, Muntjac and Chinese Water Deer, with Roe being referred to in relation to dry woodlands.

In terms of impacts, Red deer in particular were cited because of their large size and tendency to concentrate and move in sometimes large herds, 40-70+ being a recorded, with the Calthorpe Broad area recording a nursery of 100+ animals. At Heigham Holmes, a peak of 200 Reds was counted in winter 2023/24, fewer so far this winter. Reds were a particular issue in the Thurne and Ant catchments where they are long established.

Chinese Water Deer (CWD) were also regularly cited because of their high numbers and their often-specific impact on fen plants, particularly milk parsley.

Muntjac were commonly referred to, but the issues were mostly browsing in woodland, especially marginal and dry woodland.

RSPB report in the mid-Yare sites that the deer are increasingly insensitive to presence of people.

3.3 Nature of the Evidence

Other than the study of deer and fen orchid described above (Park 2018), nearly all of the evidence from site managers was observational, sometimes with photographic or video

evidence. The latter was recorded by site managers on an ad-hoc basis or taken by trail cams set for predator observations or sometimes to specifically record deer habits. NWT for the Bure and Ant have reviewed damage on satellite and aerials for sites in the Bure and Ant. In the only example of regular consistent surveys, RSPB undertake Deer Impact Assessments at Sutton Fens using a method by their reserves ecology team.

Although this level of evidence might be considered soft, it should be emphasised that all of the returns were from experienced ecologists and site and Estate managers. These observations arise from extended periods of time working on and observing changes to their sites. Their professional observations are therefore considered a robust reflection of actual impacts on their sites.

3.4 Perceived Impacts on Habitats

3.4.1 Wet Woodland

Impacts specific to wet woodland were not commonly recorded. Difficulties of accessing true floodplain wet woodland, and the low management requirement, mean even site managers may access them infrequently. Sparse impacts reports may also reflect that deer probably avoid quaggy woodlands. Severe damage to wet woodland was reported at Calthorpe Broad with direct damage to trees and damage to the ground caused by wallowing and poaching of tracks and access routes. This impacts access and management by staff. Sutton and Catfield and Reedham Marshes/How Hill recorded browsing damage which can clear out the understorey. Alder coppice is browsed out and even pollards are browsed by Reds. There is grazing of groundflora, particularly ferns. At Decoy Carr, coppiced wet woodland had been browsed out despite protection with brash.

Dry woodland appears especially badly affected with deer impact assessments undertaken by RSPB showing very strong browsing impacts and grazing of groundflora with severe impacts on bluebells. At Barton Turf Poors Fen, groundflora and especially ferns are grazed out by Muntjac. Similar impacts are described at Calthorpe Broad and on the Raveningham and Honing Estates, the latter mainly by Muntjac. These impacts are similar to well documented impacts on deer in woodlands described in Section 2 above.

3.4.2 Impacts on Fens

Three main impacts of deer on fen habitats were reported:

- Almost all respondents cite impacts from deer wallows and deer trackways directly damaging fen vegetation. These quaggy, mashed surfaces release carbon and nutrients, but probably most significant are the contingent impacts on fen management, making access by foot difficult and hazardous, and trapping the wheels of fen management equipment such as ATVs and fen cutters. Some sites, such as Calthorpe and Sutton Fen record areas as becoming nearly impassable, with access

routes and gateways for cattle becoming particularly difficult. Sutton and Catfield sites and the NWT sites in the Bure and Ant catchments report breaking up of the hover by deer, producing particularly difficult conditions. For sedge and reed cutters whose core operations depends on wheeled machines, it can mean parts of or whole sites become impractical to mow. Reduced cropping could potentially have serious long-term consequences for fen habitats. Most of the issues are with Reds because of their size, but in the mid-Yare, where there are very localised Red herds, CWD are the issue.

- Access by deer – mostly CWD – on the mid-Yare reserves allows access by predators which can impact breeding birds. This is not referred to by other respondents but must apply to all fen sites whether recorded or not.
- Grazing of the fens by deer has direct impacts on the communities through trampling and breaking up the fen surface. See also Section 3.5. Very dense trackways can affect significant areas of fens such that fen features are almost certain to be impacted. Concern about deer grazing is more variable among site managers. Reed is especially affected, although may be under-reported in the survey as most returns were from species-rich fen rather than reedbed managers. Calthorpe Broad records thinner, less vigorous and weaker reed as a consequence of heavy deer grazing. Natural England report by email that "over-grazing in the reedbeds by deer" at Horsey and at Ranworth makes specifying the appropriate grazing and mowing regimes very difficult. These observations tie in with data from Leighton Moss regarding impacts on reed. The Trinity Broads reports grazing of transition fens. At Wheatfen, the concern is with individual species grazing rather than effects on communities. Impacts in the Bure, at Woodbastwick, are less significant on fen communities but concentrated deer trackways still impact access routes. Reflecting on their Bure and Ant sites, NWT feel ambivalent regarding the impact of deer grazing on fens, citing a parallel with fen grazing schemes used to diversify fen structure. They feel this aspect would need further study to determine positive/negative impacts.

3.4.3 Impact on Wet Grassland

Unsurprisingly, there was relatively little impacts recorded on these open habitats of short-grazed grassland. Some wallowing was reported at the Honing Estate, with some path damage at Woodbastwick. Some reported damage to dykes in grazing marshes with consequent impacts on water quality. Natural England report Reds are compromising the success of arable reversion to grassland, with trampling impacting grass establishment and poaching mobilising unstable surface peaty soils. At Heigham Holmes there are enough deer to churn up gateways and to break down dyke edges, infilling them in places and allowing cattle escapes. Significant impact on the grazing operation is noted. At Sutton, deer grazing pressure is considered severe enough to deplete cattle food resources, resulting in more on-site feeding.

3.4.4 Impact on Aquatic Habitats

Consistently across most sites, significant localised damage to dykes was reported at deer crossings with broken down banks, destroyed vegetation and impacts on water quality which could spread well beyond the point of impact. Natural England report ditches of high value had been badly damaged by Reds crossing dykes, needing remedial works. At Calthorpe Broad, swimming herds of Reds are said to affect the Broad itself. Sutton and Catfield had concerns over spreading of invasive non-native species (particularly *Crassula*). Although not reported by others, this is likely to be a significant risk across the Broads.

3.5 Perceived Impacts on Species

3.5.1 Impact on Birds

The impact of browsing and grazing on birds nesting in the low understorey in both wet and dry woods was frequently referenced. Impacts of grazing and trampling on habitat structure and therefore on fen breeding birds, particularly reed and sedge warblers, was a concern at Calthorpe Broad and Woodbastwick. Heigham Holmes were concerned about disturbance to wintering wildfowl and breeding cranes, and trampling of wader nests. RSPB at Sutton, Catfield and Yare valley were concerned about impacts on Bittern, Crane, Marsh Harriers, Woodcock and ground nesting waders through disturbance and trampling, and also to increased predation. These sites support high densities of these birds. The contingent impacts of deer on habitat structure and composition, and on the area of the site that can be effectively managed, were also cited by RSPB.

In summary, breeding bird guilds of woodlands and reedbed and fens were most directly impacted because of direct effect on favoured habitat structure and composition. They are also indirectly affected by impacts on fen management.

3.5.2 Impact on Plants

Most respondents refer to browsing and grazing impacts on plants of woodlands and fens in a general way. Browsing on woody plants can have a specific and detrimental effect over the long term. Some severely impacted sites such as Calthorpe Broad refer to destruction of plant communities by wallowing and trampling. Grazing in woodland particularly affects groundflora and, where present, ferns.

In fens, the species most cited as affected is Milk Parsley, with documented impacts on mature and emerging plants, supported by photographic and video evidence. Detailed observations at Mill Marsh suggests grazing mature plants can kill them, while generally flower and seed production is reduced (Figure 3). Milk Parsley may be selected by deer, particularly CWD, as other umbellifers e.g. Angelica, are not taken. At Mill Marsh, Barton, the milk parsley population is small, so grazing can take out a high proportion of the population, reducing flowering and seeding. At Reedham Marsh and How Hill, grazing by

Figure 3: Above: Trailcam Capturing CWD Grazing Milk Parsley at Mill Marsh. Below: Grazed off Milk Parsley at Mill Marsh. July 2024. © Hannah Breach and Kevin Radley.

CWD in the open fen stands is so severe that large plants capable of supporting swallowtail butterflies are mostly restricted to closed, infrequently managed fen around the margins.

BA also report heavy grazing of the rare Crested Buckler Fern at Reedham Marshes/How Hill. At Sutton and Catfield, grazing of Fen Orchid may be an issue.

In addition, all rare plants will be affected by contingent impacts of reduced site management (see Section 3.6).

3.5.3 Mammals

There were no specific impacts on mammals. RSPB suggested impacts on water voles, unspecified but perhaps associated with damage to dyke edges. RSPB also cite transmission of blue tongue.

3.5.4 Invertebrates

There are likely to be contingent impacts on invertebrates – of changing habitat structure, impacts on dyke water quality, damage to habitat structure and changes to food plant availability. The impact of grazing on milk parsley and therefore swallowtail butterflies is a frequent concern, with direct consumption of eggs and larvae being documented at Mill Marsh, Barton. At the latter site, most of the plants large enough to support swallowtails can be grazed off.

3.6 Perceived Impacts on Assets

3.6.1 Fences, Gates and Infrastructure

Many sites reported damage to fences, particularly at regular crossings, and especially with large herds of Reds. Sutton and Catfield report this to be a particular problem along the fen/arable boundary, and that deer damage encourages cattle to put pressure on the weakened fence line. BA report planks of bridges being broken by Reds at Reedham Marshes/How Hill. At Calthorpe boardwalks have been broken or damage, some of which are used for management access.

3.6.2 Sluices and Water Level Management

Also very widely reported was damage to water level management infrastructure with trackways, wallowing and trampling damaging culverts and sluices, breaking down banks, blocking pipes and even ditches, and eroding water control banks and structures. Poached paths around sluices can by-pass water retentions causing leakage. Dead deer (CWD) have been reported blocking pipes e.g. on the Mid-Yare reserves and at Sutton and Catfield.

Where erosion of banks affects major water courses, there can be significant risk of flooding such as the breaking down of the banks along the Muckfleet near Burgh Common, or the

erosion of the bank along the Hundred Stream at Martham reported by BA and NWT respectively (Figure 4). In addition, such breaches can affect water quality in the receiving habitats.

Because of the impact on managing water levels and water quality across fen compartments, this kind of damage can have far reaching consequences for all habitats and species.

3.6.3 Paths Banks and bunds

Erosion of flood banks is described above (Figure 4). The damage or destruction of access paths, gateways and even constructed paths such as boardwalks (e.g. at Calthorpe Broad) is widely described by most respondents. The impact on visitor and reserve management infrastructure and even on cattle grazing is clearly expressed in the questionnaire returns.

Figure 4. Deer Damage to Floodbanks. Water is pouring out of the Hundred Stream into the dykes of the Horsey Estate and NWT Starch Grass, Martham. February 2024. © Richard Starling

Damage is most severe with large animals in herds such as Reds, and is made worse by high water levels which softens substrates and concentrates animals on more accessible routes. At Burgh Common, BA report that damage is so bad that "….access to parts of the site on

foot (even in waders), let alone machinery, is impossible for most of the year. Access…….. is now only feasible in mid-late summer during periods of low water levels". Similar comments were made for Reedham Marshes and How Hill.

In addition, such damage makes sites hazardous to people and management machinery and by closing accesses can reduce areas effectively managed. At Mill Marsh, Barton, deer tracks have so prevented use of wheeled mowers that the fen has to be cut by hand with brushcutters.

3.6.4 Impacts on Peat

All of the foregoing implies significant damage to the peat surface along trackways and wallows, with loss of peat structure, creation of slurry peat, with likely consequent release of nutrient and carbon. The particulated peat can then be subject to erosion by intense rain or flood waters although floodplain energies are too low to create major peat erosion features.

With significantly impacted fens (1500m/ha of trackways), assuming a 0.3m width of ground affected by trampling, this represents 450m^2 per ha of degraded peat, or 4.5% of the fen surface. If the tracks are assumed to be 0.3m deep, 135m^3/ha peat would be degraded and releasing carbon. If all of the 1700ha of fen were so affected, this would total 229,500m^3 peat destroyed. Sampling of trackway densities reported below are often significantly above 3,000m/ha, suggesting up to 400,000m^3 of peat could have been destroyed across the Broads fens. These estimates do not include wet woodland or grass marshes.

3.6.5 Other Impacts

No impact on archaeological features was recorded. However, Broads Authority (Andrea Kelly, pers. com.) cites the presence of many old, raised tracks built up for access, and old peat baulks between diggings. These drier and firmer tracks are likely to be used preferentially by deer may be suffering significant but undocumented damage.

The Honing Estate noted damage to crops including sugar beet. Some respondents cited the health and safety risk posed by damaged and boggy areas.

At Calthorpe, the risk to people of a stampeding herd of Reds, or at Sutton and Catfield, aggressive or rutting stags, was also cited. Natural England (Elaine Green, pers comm) note that the increasing deer density is causing build up of parasites and with it, increased risk of Lymes Disease, a serious human condition. NE suggest this could affect safety assessments when deploying volunteers.

3.7 Positive Impacts of Deer

This was not a well populated part of the questionnaire, but comments suggested some unexpected positives. The Raveningham Estate observed that deer tracks through reed can open access to the interior for Rudd and therefore benefits Bitterns. The browsing of bramble in drier reedbeds and transition areas was thought beneficial in the Trinity Broads area. Control of scrub was occasionally cited as a benefit. At Woodbastwick and the RSPB reserves, diversification of fen structure and creation of bare ground for plants was felt to be beneficial while trackways could be conduits for species distribution including fen orchid. RSPB felt trackways could help circulate good quality water around the fen. At Woodbastwick, deer were considered to be recreating natural herbivore behaviour that conservationists aim for, although it was noted that this was highly density-dependent and could easily tip into damage at high population levels. It was David Hooton's opinion (Forestry Commission, pers comm) that deer are much more selective browsers and grazers than large stock and that their grazing pressure on key species was disproportionate and not comparable to desirable herbivores.

3.8 Reported Deer Management Measures

The private estates like many farmers are undertaking culling. There is culling at Calthorpe Broad with 25 Red and 50 Muntjac in the last seasons. Extraction during the winter season is a significant limitation on fen or wet woodland sites. No other respondents are undertaking culling, although neighbouring landowners often are.

Exclusion measures are localised and uncommon. Tree guards are used at the Honing Estate and are probably ubiquitous on tree planting schemes elsewhere. At Calthorpe Broad there are small exclusions using electric and Heras fencing. RSPB have fenced around a Crassula remediation site at Sutton Fen to stop deer and cattle spreading the INNS. The experimental turf stripping plots at Barton Turf Poors Fen required protecting from red deer by covering with brash lest they encourage wallowing. Otherwise, there is no active exclosure.

Most sites report remedial work needed, sometimes with ongoing costs. Figures reported by landowners suggest deer control can require 3.7 hrs effort per deer culled. At Calthorpe, infrastructure repairs cost £3K in 2024/25, so far with path works at Woodbastwick costing £300-400 plus 4 days staff time every year. At the Trinity Broads, they will be installing ligger paths to gain access to parts of the site at a cost of £3300 - £5200. This is also undertaken at Mill Marsh Barton Turf. At Reedham Marsh and How Hill, damaged paths have been infilled with cord wood and peat-filled sandbags to allow access, while an eroded bank will be repaired by an excavator and imported fill. NT at Heigham Holmes have undertaken extensive ditch works to repair deer damage in the last 12 months. At Sutton Fen, fence repairs are needed regularly, plus work to repair sluices and digger work to repair banks, ditches and wallows. There is an impact on staff time to manage this work and an increase in time accessing the site by foot where ATV access is no longer possible.

NWT emphasise that damage to infrastructure made of peat, or set into peat, is especially difficult. Trampled/wallowed peat loses structure and becomes a sloppy mess that cannot be used to repair the damage. Remedial works are more difficult, expensive and time consuming.

All of this remedial work, and the extra staff time required, reduces resources for site management with contingent impacts on species and habitats.

3.9 Monitoring

Very little objective or repeatable monitoring is undertaken, mostly observational across estates and farms. At Raveningham these observations determine the level of cull each year. Reference has been made to RSPB's annual Deer Impact Assessments at Sutton and Calthorpe. Some observational information is being collated, and at Heigham Holmes counts have been made in the last two years. In dense fen and woodland this is very difficult and takes significant staff time. RSPB wildfowl and wader counts also aim to count deer especially CWD. At Calthorpe Broad, deer exclosures are being set-up to monitor impacts on features. Similar exclosures are being considered elsewhere.

4. Survey and Monitoring Method

4.1 An Objective Methodology

The requirement is to produce method whereby the impact of deer on wetland habitats can be assessed. It should provide wetland managers with the evidence base with which to decide whether or not deer management measures are necessary. The evidence base should be adequate to provide reassurance to the public and other stakeholders who may need convincing of the need for control measures.

The method needs to be objective, relatively simple, and based on measures which do not require high technical competences.

The method should be repeatable, and so form a monitoring tool.

Finally, the method needs to key into the established national deer impact monitoring protocol described in Forestry Commission (2023).

4.2 Two Stage Approach

It is possible to undertake the whole of the recommended methodology, including field-based assessment, but this could result in unnecessary effort if (a) deer damage is not considered significant or (b) so severe that immediate action is justified. Hence a two-stage approach is recommended, with initial Screening providing a first review of need, and the second stage providing more detailed evidence and forming the basis for monitoring.

4.3 Scale

It is not meaningful to consider compartment by compartment assessments because deer range over such wide areas. In some sites (see Hickling Hundred Acre Marsh, or Calthorpe Broad below), different compartments may show different impacts. The assessments should look at varying densities of impacts across the site (vegetation type may to some extent determine levels of impact), but ultimately the trigger for action may be the impact on worse affected or most valuable fen compartments. This may provide sufficient justification for deer control measures.

If there is a small area of severely affected fen amid a much larger area of fen with acceptable impacts, deer fencing may be a more appropriate solution.

Hence before the scope and scale of deer control measures can be decided, a full assessment of the site, and perhaps the area encompassed by the deer populations, may be needed.

5. Stage 1 Screening Procedure and Mapping

5.1 Stage 1: Screening

5.1.1 Immediate Action

Here, the site manager determines if there is enough observational evidence to consider action. If damage is obviously severe and unacceptable, and if the public engagement issues are very modest, the site manager may progress to direct interventions including culling. This pathway has been followed for example at the severely affected Calthorpe Broad. Even then, the evidence underpinning this decision should be documented, with comprehensive observations including photographs made. This evidence should be collated into a detailed summary based on the Questionnaire contained in Appendix 1.

5.1.2 Full Screening Through Mapping Deer Tracks

If the site manager feels there is cause for concern, but the levels of damage suggest further scrutiny is needed, or if there are sensitive public engagement considerations, full screening should be carried out.

The density of deer tracks (referred to as “racks” in FC reports) visible in fens has been a reliable indicator of impact in studies by RSPB (2024) and Park (2018). Mapping of trackways and other damage indicators on GIS from a base aerial photo layer should be undertaken ideally using winter-flown aerials which better show the tracks. density of trackways (m/ha). Densities which approach 1500m/ha are likely to be a cause for concern although damage below this could also result in damaging impacts.

The density of wallows (number per hectare) and the density of deer dyke crossings (number per hectare) could also be recorded although in practise this may be difficult to ascertain from aerials and is better recorded in the field.

The fen area of concern should be divided by inspection of the aerial into areas that have similar track density. The above metrics are then calculated for each area. The appropriate density can then be displayed.

If the site has widespread high levels of damage, or if medium density damage coincides with sensitive site features (e.g. Bittern nesting areas, fragile plant communities, locations of rare species), the site manager should consider the level of risk to features of conservation interest.

If the risk to features is high, and/or there are no public engagement considerations, the site manager could proceed directly to deer control measures including culling.

If further information is needed to inform interventions, or there are sensitive public engagement considerations, the site manager should proceed to field-based assessment.

5.2 Mapping Deer Tracks in Stage 1 Screening

A number of sites were piloted by mapping of deer tracks to assess the efficacy of mapping.

It is essential to use high quality aerials with good definition, flown in winter. Figure 5a and 5b compares an extract of high-quality winter aerials from 2020 at Calthorpe Broad with the same area from a summer Bing Satellite image. The latter do not have sufficient definition to record finer trackways and will underestimate deer impacts.

Figure 5. (a) Extract of high-definition winter aerials. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020 **(b) The same area from Bing Satellite** © Bing Satellite

5.2.1 Calthorpe Broad

The trackways in the open fen around Calthorpe were mapped (Figure 6). First, the fen was divided into two, Area 1 seeming to have low density tracks, Area 2 high density. The tracks were traced on QGIS and the track lengths and densities calculated (Table 5).

Table 5: Area of Trackways at Calthorpe Broad Fen.

	Area (ha)	Length of Track (m)	Density (m/ha)
Area 1	0.46	218	474
Area 2	1.9405	4,859	2,504

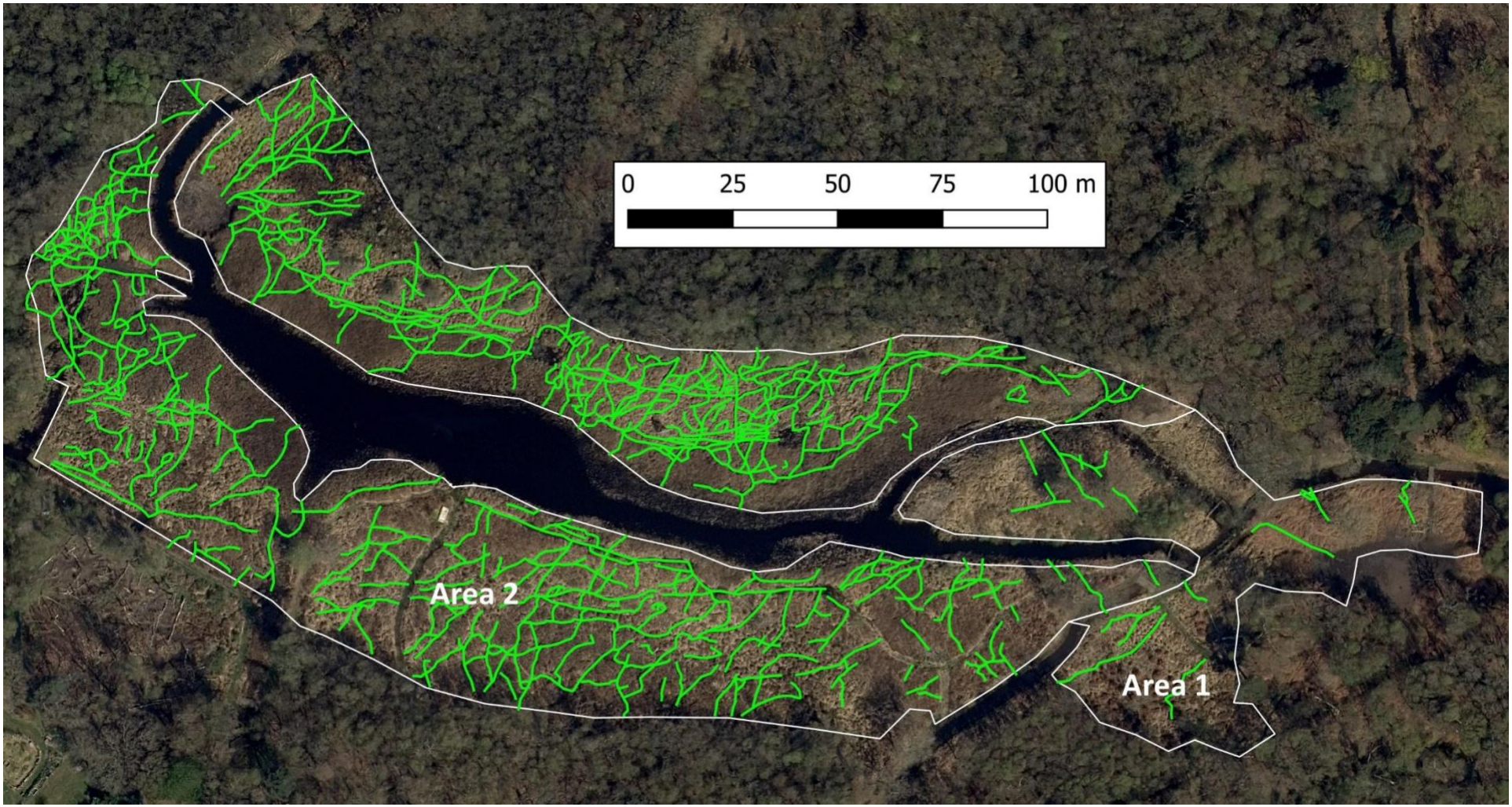
The density in Area 2 is so high that at times it appeared that the habitat was a mosaic of track and fen. If an assumed mean width of 0.3m is applied, this gives density of 751m^2/ha of peached surface, which is 7.5% of the fen. The distance between tracks was around 4-5m, up to 8m. Such is the density of track that it is difficult to imagine that any habitat feature or any guild of fen and reedbed breeding birds are unaffected. The density in Area 2 is around twice that recorded by Park (2008) at Sutton Broad South and close to twice the High Impact threshold recorded by RSPB (2024) at Leighton Moss.

Under such circumstances it is difficult to see how the designated features could be maintaining Favourable Conservation Status on this site. This may include the Broad which the deer swim across regularly – perhaps because it is so narrow, and swimming requires less effort than traversing around. The impact on the fen is probably especially intense because it represents a small, narrow glade within a large area of woodland.

Stage 1 Screening Outcome: Such is the clear density of tracks that the site manager should consider moving straight to deer management without further survey.

Deer tracks in Area 1 are much less dense and may not be a cause for concern. Progression to Stage 2 would be appropriate. However, as the deer population range across both areas there is no possibility of having different deer management strategies for each Area. Hence the evidence of Area 2 is probably sufficient to determine deer control for the whole site.

Figure 6: Trackways Mapped in Two Areas of Fen Around Calthorpe Broad. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020



5.2.2 Sutton Fen

The trackways in a sample area in the middle of Sutton Fen, managed by RSPB, was mapped. The location of the sample and the tracery of tracks are shown on Figure 7. Results are summarised in Table 6.

Table 6: Area of Trackways at Sutton Fen.

	Area (ha)	Length of Track (m)	Density (m/ha)
Area 1	3.6674	13,531	3,689

Track density is more than at Calthorpe and considerably more than the High Impact levels recorded at Leighton Moss and at Sutton Broad South by Park (2008).

Visual inspection of the Sutton Fen area suggests this was not an exceptional density but was typical of most of this area of Fen. With a mean base of track width of 0.3m, this represents 1,107m^2 of damaged peat or 11.1% of the fen area.

While these figures are very high, the area is also grazed by cattle. It is not known whether deer and cattle use the same tracks or the total density of deer + cattle results in greater density of tracks.

Clearly, the level of impact is exceptionally high. It is difficult to see how designated feature vegetation types or fen and reedbird breeding birds could maintain Favourable Conservation Status under this intense level of impact.

When the site was last surveyed in 2016 (OHES 2017), this area was mapped as an intermediate community between the Typical and the wetter, richer *Cicuta virosa* sub-community of S24 *Phragmites australis-Peucedanum palustre* Fen, with the north-west quarter mostly a dryer and scrubbier area of the *Myrica gale* sub-community. There is no patterning in the trackways which reflects the any patterning of vegetation recorded by OHES (2017).

Stage 1 Screening Outcome: Such is the clear density of tracks that the site manager should consider moving straight to deer management without further survey.

5.2.3 Drakes Fen

Drakes Fen, also managed by RSPB and lying directly south of Sutton Fen, shows the impact of gathering places for deer. These are circled in Figure 8. They are 5-10m in diameter and connected by highly impacted fen. In contrast, there are stands of lower density tracks in what appears to be reed-dominated fen in the surrounding area. Density of deer tracks in this compartment seems more complex than on the wider areas of Sutton Fen.

Figure 7. Tracks at Sutton Fen. Left: Location of Sample Plot (3.6674ha) Right: Plotted Tracks. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020

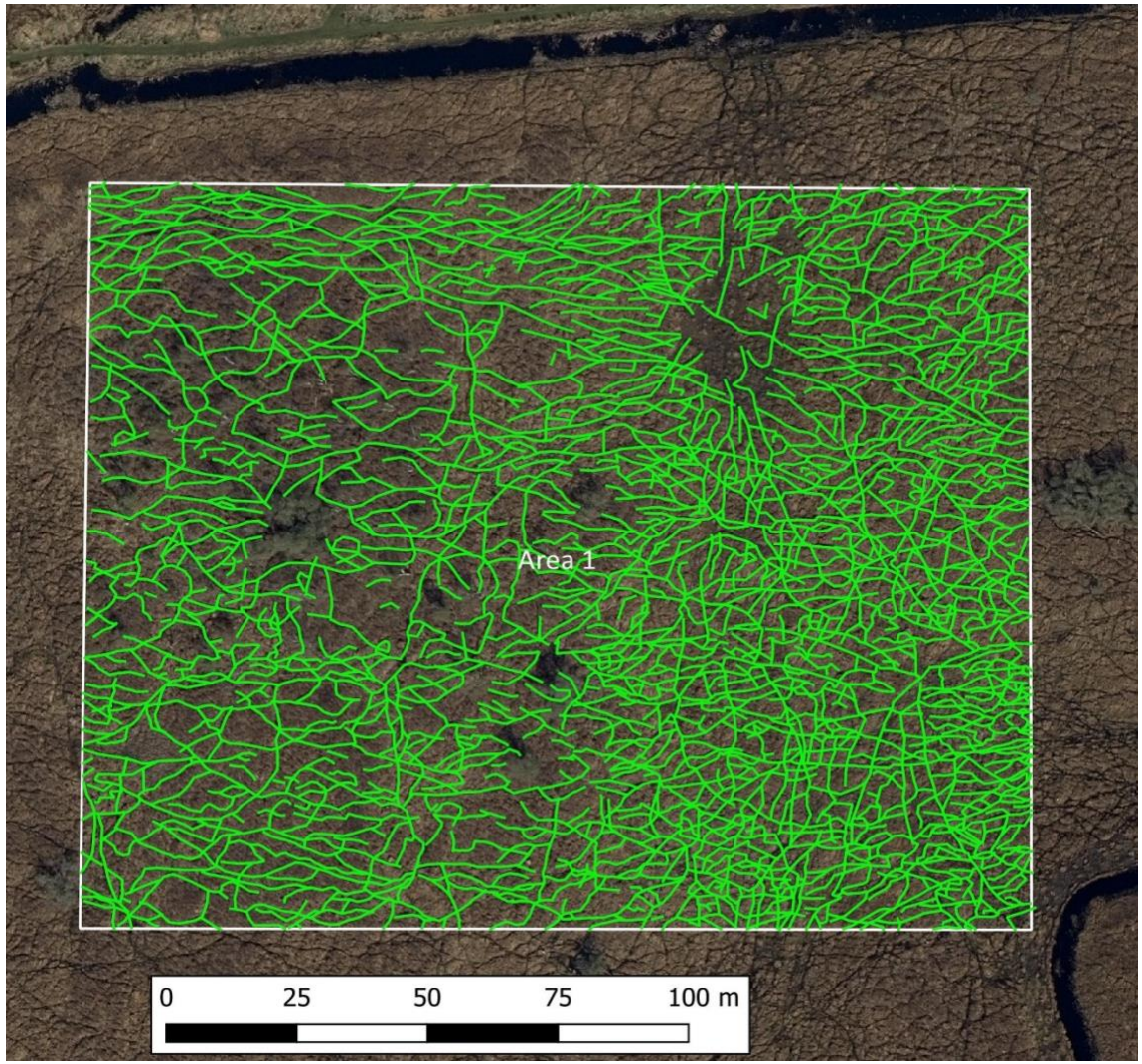
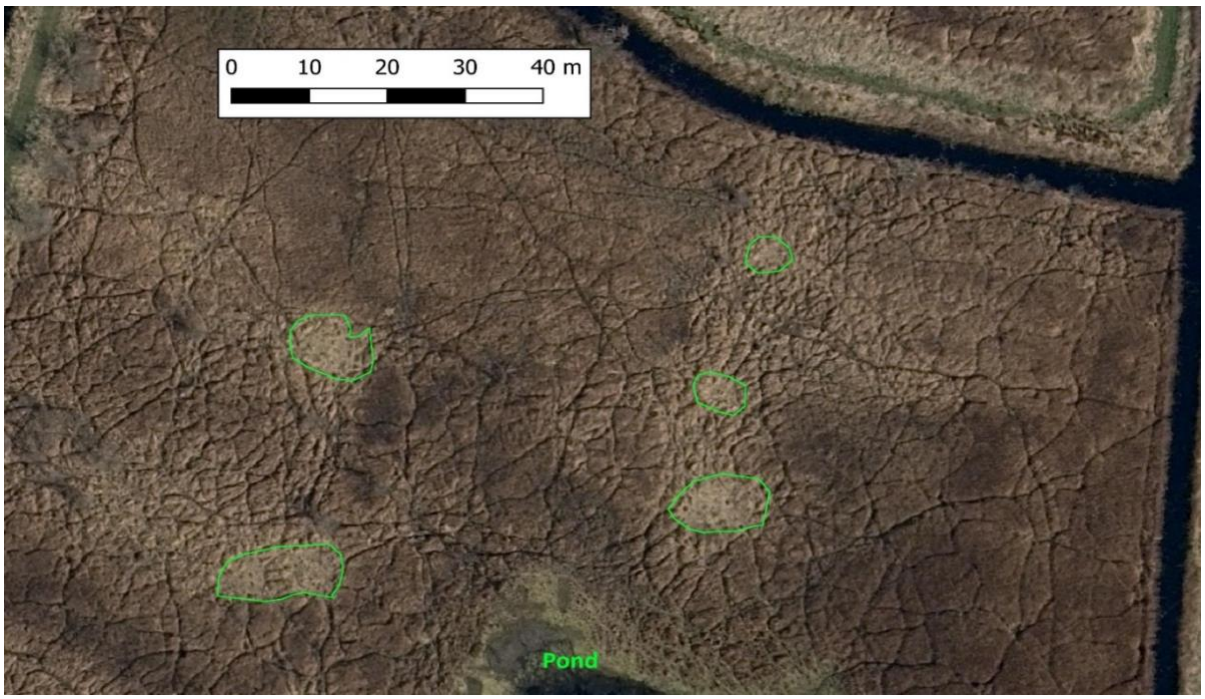


Figure 8: Areas where deer clearly concentrate on Drakes Fen, Sutton. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020



A screen grab of the map of NVC communities in OHES (2017) is shown in Figure 9. This shows a simple division between the drier Typical sub-community of S24 in the west and the wetter *Cicuta virosa* sub-community in the east. The tear-drop shaped polygon is an area of dryer S24-BS3, intermediate between S24 and a dry and species poor *Phragmites-australis-Calamagrostis canescens* community. Presumably this on raised ground, and includes 2-3 of the gathering areas. The other gathering areas seem to be in drier S24. The reed and wetter *Cicuta* sub-community seem to be avoided.

Figure 9: NVC Survey Community Map at Drakes Fen, from OHES (2016) © OHES

5.2.4 Burgh Common

Two areas in the south part of the site ("the Doles") were examined. Superficially they appeared to have different densities of tracks showing on the winter aerial (Figure 10). Area 1 appeared to have less dense tracks than the previous sites while Area 2 seemed to have tracks of similar density.

Closer inspection showed that the tracks seemed to be either substantial wide tracks or very narrow tracks that sometimes difficult to see. Presumably these represent heavily and lightly used trackways respectively, also presumably with different levels of ecological impact.

The density of tracks has been mapped (Figure 11) and summarised in Table 7.

Table 7: Area of Trackways at Burgh Common Doles.

	Area (ha)	Length of Track (m)	Density (m/ha)
Area 1	1.5933	3,522	2,211
Area 2	3.4845	9,934	2,851

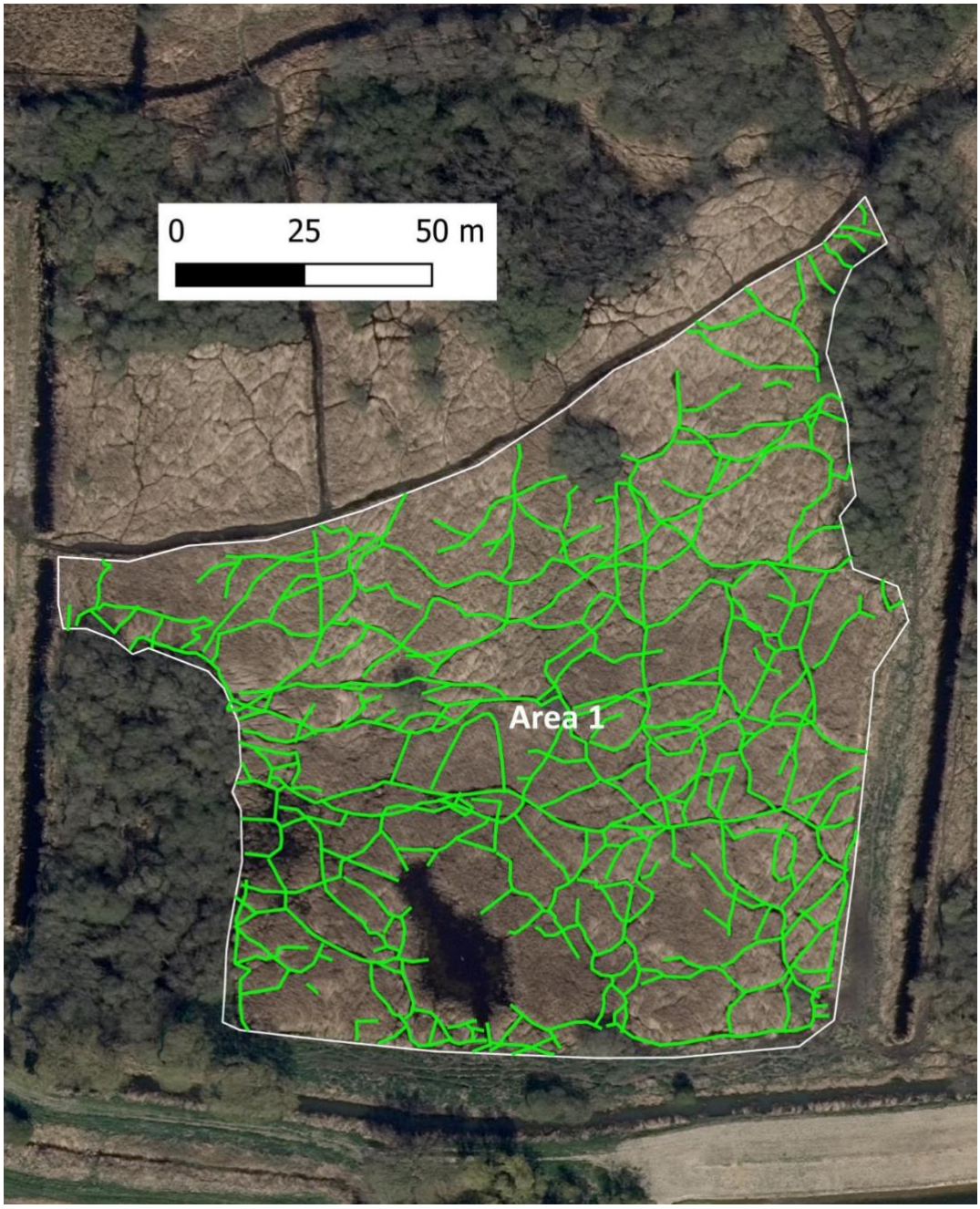
Area 1 did have less dense trackways than Area 2, but the difference was less than expected. Both areas had more tracks than initial inspection suggested because of the faint tracks.

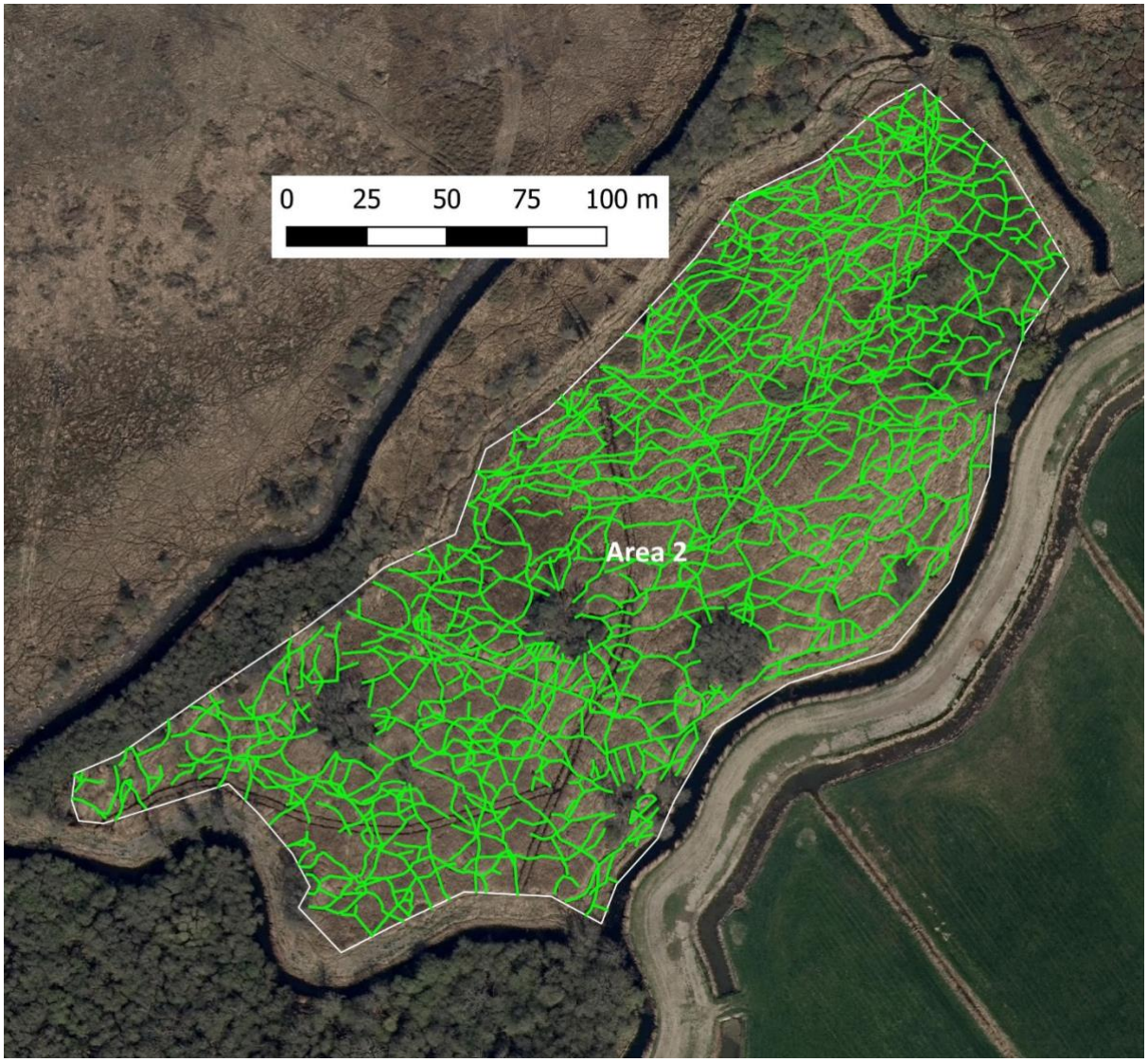
The densities are well above those recorded at Leighton Moss and by Parks (2008). They are much less than recorded on Sutton Fen, similar to the highly impacted Area 2 at Calthorpe. However, Calthorpe had mostly very clear trackways. The impact of the tracks at Burgh Common may consequently be less, including on surface peat condition. If the tracks were assumed to impact 0.3m width of peat, areas 1 and 2 would have 663m^2/ha and 855m^2/ha impacted respectively or 6.6% and 8.6% of the fen. However, the faint tracks traced are unlikely to be so severely affected, so the calculation becomes unreliable.

Stage 1 Screening Outcome: Based on the track density, it would be reasonable for site managers to begin deer control measures, especially on Area 2. However, a more cautious approach might suggest Stage 2 Field Assessment would be helpful, as so many of the tracks are very faint and of uncertain impact on the fen vegetation and specialist fen fauna. Whether or not to move to Stage 2 might depend on sensitivity of deer control on the local area, the intrinsic value of the fen area and the already-observed impacts on site infrastructure. An assessment of risk to the known vegetation Features, breeding bird communities and key infrastructure could be undertaken, and if uncertainties remained, a Stage 2 assessment could be undertaken.

Figure 10. Two Sample areas at Burgh Common Doles. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020

Figure 11. Mapped Deer Tracks at Burgh Common Doles. Above: Area 1 (1.5933 ha) Below Area 2 (3.4845 ha). © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020





5.2.5 Hickling Hundred Acre Marsh

Hickling fens include extensive S4 reedfen supporting a wide range of reedbed specialist breeding birds. It is one of the key sites in the UK for this group of breeding birds. The fens also contain more mixed vegetation with stands of scrubby acid nuclei and the rare crested buckler fern.

Figure 12a shows one area on the north side of Hickling Broad with two contrasting fen types. The east compartment is more mixed fen and shows dense, large deer tracks. OHES (2014) map a range of fen types here – S25 *Phragmites australis-Eupatorium cannabinum* fen, intermediate with S24 *Phragmites australis-Peucedanum palustre* fen, BS3 *Phragmites australis - Calamagrostis canescens* fen and BS5 *Dryopteris cristata-Sphagnum* species fen, the latter being the very valuable acid fen with crested buckler fern.

The west compartment shows typical reedfen, mapped by OHES (2014) as uniform stands of S4 *Phragmites australis* swamp, the *Phragmites australis* sub-community. This vegetation is dense and even aged, with more modest densities of smaller deer tracks.

Figure 12. (a) Above: Two compartments with contrasting vegetation and deer impact. (b) Below: Close up of east compartment showing impact on dyke margin. Deer Couches/wallows shown circled white. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020.

Management may play an important role here with the mown reed obscuring the tracks. Figure 12b shows the south part of the reedbed. The dyke side margin shows seemingly different vegetation type, perhaps influenced by spread dyke spoil. This has been more severely impacted, showing deer scrapes or wallows with isolated couches in the reed.

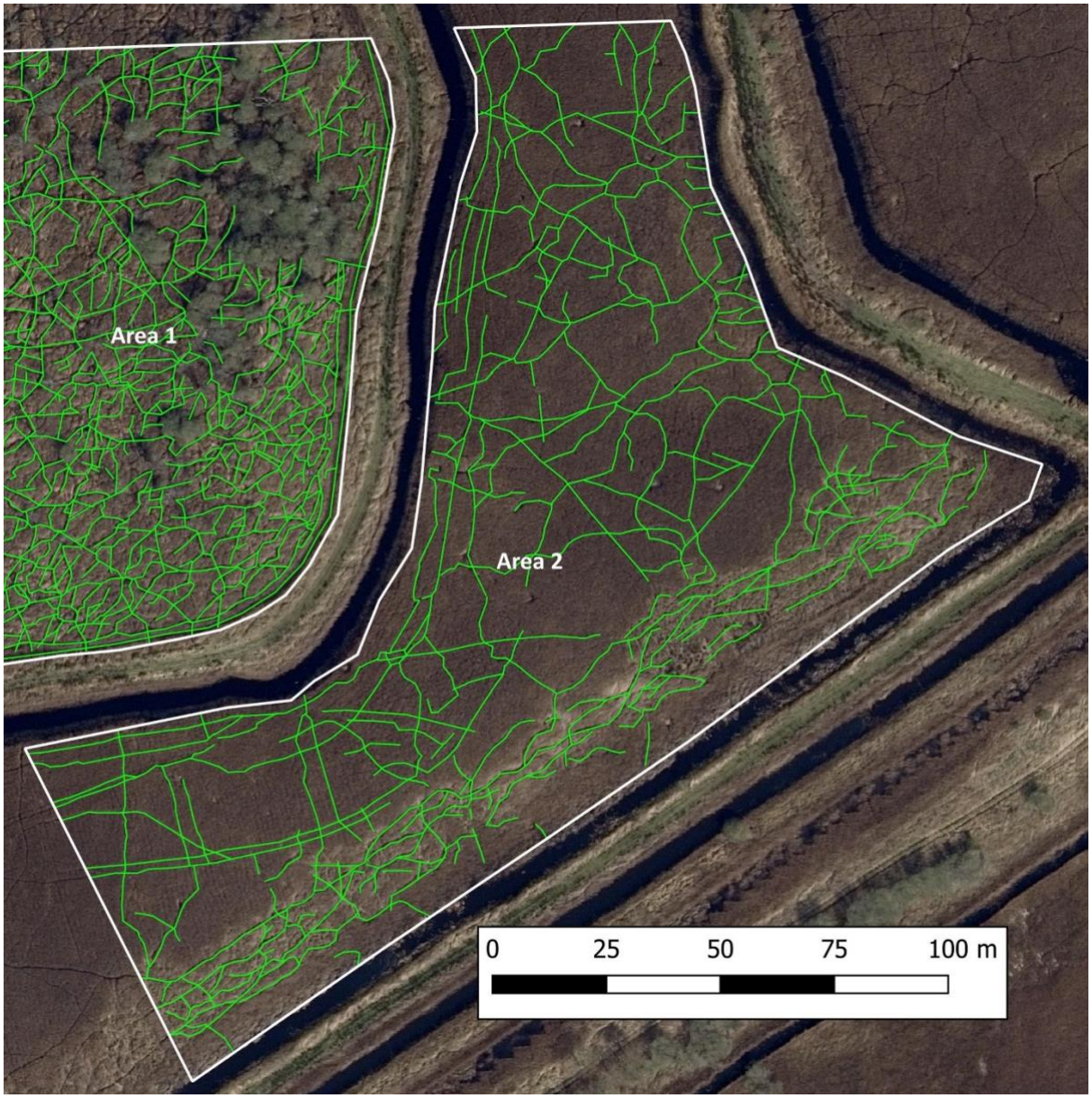
The deer tracks on the two areas were mapped and track densities calculated (Table 8; Figure 13 a and b)

Table 8: Area of Trackways at Hickling Hundred Acre Marsh.

	Area (ha)	Length of Track (m)	Density (m/ha)
Area 1	2.303	8,550	3,712
Area 2	1.926	4,389	2,279

Area 1 clearly has a greater density of tracks than Area 2, although visual inspection of the track maps suggests a greater difference. The density in Area 2 is enhanced by the more intensive used of the dyke-side strip. In addition, it was clear during mapping that the trackways on Area 1 were strong and wide whereas many of the tracks in the reed on Area 2 were faint and narrow. It is not known whether this patterning reflects more intense use of Area 1 or greater masking of tracks by taller and tighter-packed reed stems on Area 2. If these tracks were 0.3m wide then Area 1 would have 1114m^2/ha and Area 2 would have 684m^2/ha, or 11.1% and 6.8% of the fen area respectively.

Figure 13. (a) Above: Area 1 with scrub and mixed fen vegetation. (b) Below: Area 2, dense S4 Reedfen. © Broads Authority 2024. © Bluesky International Limited and Getmapping 2020.



The densities are well above those recorded at Leighton Moss and by Parks (2008). Area 1 has a very high density, slightly more than Sutton Fen. Area 2 is similar to the lower impact area at Burgh Common and significantly lower than the high impact area at Calthorpe Broad. The data suggest that deer prefer the dryer ground and avoid the very wet reed fen, although this is still heavily impacted.

Stage 1 Screening Outcome: Based on the track density in Area 1, it would be reasonable for site managers to begin deer control measures immediately. All of the vegetation features are likely to be impacted, including rare and fragile types. Although track density in Area 2 is low it is still high and above the density demonstrated to be damaging on other sites, and therefore direct deer reduction could be justified. However, there is doubt regarding the significance of “faint” tracks in Area 2. As a precaution, further site assessment could be helpful in Area 2 to assess the significance of the tracks.

Note, however, that further studies could be an academic exercise. The deer using Areas 1 and 2 will be the same. It is not practical to have separate deer management strategies for two adjacent parcels when the deer population is the same. This begs the question what is the appropriate scale to decide deer management? Ideally this would be at the deer population scale. This is the only scale that makes ecological sense.

5.2.6 Surlingham Marshes South

Surlingham Marshes South is on the south (right) bank of the river Yare. The main deer species is Chinese Water Deer. Red Deer are not thought to be in this part of the Broads. The sample Area 1 is just north of Rockland Broad (Figure 14).

Figure 14. Mapped Tracks in a Sample Area at Surlingham Marshes South© Broads Authority 2024. © Bluesky International Limited and Getmapping 2020.

Tracks were mapped in the usual way (Table 9). The tracks were mostly more modest than in the northern catchments as the animal size is smaller. Discerning the tracks was difficult, some seeming to be little more than creases in the fen canopy. The fen type appeared to be different with a softer visual appearance, much less reedy. In the Fen Ecological Survey (OHES 2014) the area was sampled as S26 *Phragmites australis-Urtica dioica* eutrophic fen, the *Epilobium hirsutum* sub-community, a fen type generally with *Glyceria maxima* abundant.

Table 9: Area of Trackways at Surlingham Marshes South.

	Area (ha)	Length of Track (m)	Density (m/ha)
Area 1	2.342	6,934	2,961

This is a high density, well above those recorded at Leighton Moss and by Parks (2008), but not reaching the highest densities recorded in Area 1 at Hickling or at Sutton Fen.

If the tracks had an average width of 0.3m this could represent 888m^2/ha or 8.9% of the fen area, but the faintness of the tracks and the lighter weight of the species make mean this is likely to be an over-estimate.

Stage 1 Screening Outcome: Based on the track density in Area 1, it would be reasonable for site managers to begin deer control measures immediately. However, if there were sensitivities over population reduction, further impact assessments could be undertaken. The fen in the sample area is currently not especially species-rich and is not likely to be an SAC feature vegetation type. It may support some populations of Milk Parsley and Swallowtail butterfly, thought to be targeted by Chinese Water Deer. The tracks appear very small on the aerial. While the density of tracks is therefore very high, the consequent impact on fen ecology is less certain. Cautious site managers could therefore undertake a Stage 2 screening.

6. Stage 2: Field Assessment

6.1 Survey Planning

The assessment is based on repeatable walks through the fen and wet woodland areas. The Stage 1 Scoping should allow initial zoning of the site. This enables sampling if the area is very large. Sample areas should include a range of track densities.

Selection of areas to survey must consider the site management objectives and/or the key designation features, so that the survey can be used to assess the impact of deer on delivering objectives or achieving Favourable Conservation Status respectively. If the site is large and resources mean sampling is needed, the selected sample areas must be representative of site management objectives and key habitat and species features.

Walks through the woodland or fen should be selected to pass through the key areas related to site objective/designated features. Walking along rides or raised pathways is unlikely to be representative, but sections vulnerable to erosion, or leading to key infrastructure, should be included. All locations of key water management and habitat management infrastructure should be included.

Spring is the favoured time, but site flooding or other conditions such as potential disturbance to nesting birds, may force variation. If particular species are a concern, the survey may be timed to coincide with their key life cycle stage, e.g. larval stage of Swallowtails.

Survey Planning should include training for field surveyors and site managers. Such training could include:

- Deer identification and ecology.
- Impacts of deer on habitats.
- Deer survey methods.
- Interpretation of deer survey results.
- Options for management of deer.

Because this is a relatively new area of activity, proprietary courses in many of the above topics are not available, requiring bespoke training for site managers.

6.2 Field Recording of Impact

To ensure consistency, Stage 2 is based on the Forestry Commission (2023)/Cooke (2007, 2009) method, adapted for wet woodland and fen, and taking account of evidence provided through the questionnaires. In preparing for and undertaking field survey, these sources should be read in detail to familiarise the surveyor with key terms and assessment methods.

The core method is to walk a fixed route and to record important indicators of deer activity (such as a wallows and tracks) consistently on each visit. As the survey proceeds, each time an indicator is found, it is given a tally mark on the standard form (the Tally Sheet) using the "5 bar gate" tally system. The FC guide describes how each indicator should be assessed (or tallied) and how the Condition Score is derived.

The original FC Tally Sheet (available at WS1DeerHabitatImpactActivityRecord.xlsx) has been adapted to fit the Broads context. The work of the Forestry Commission in developing the original template is gratefully acknowledged. The adapted forms are shown in print form in Appendix 2. The form can be adapted, but it is recommended that the core indicators be retained. New indicators should be added, if the site requires it.

A separate survey sheet (Tally Sheet) must be completed for each habitat unit or zone within each unit. Never complete a single survey form for two or more habitats e.g. fen and woodland. Small areas of scrub within open fen should be considered part of the fen, as they will affect how deer use the open fen.

Over time, amendments to the forms may become necessary, as might changes to the survey units. The survey should respond to changes in gross changes to site habitats and structure, e.g. removal of woodland, creation of new features, installation of grazing areas.

Even so, all the activity and impact indicators should be retained to maintain repeatability. For instance, if bramble is not present when the survey starts, it could re-appear if deer numbers were reduced. Because of the likely influence on deer behaviour, it is useful to summarise management undertaken in the preceding year, including recording no management.

6.3 Deriving A Deer Activity Score

The sum of all the tally marks in a row of the form allows that attribute to be scored as either None/Minimal, Low, Medium or High. There is guidance in Forestry Commission (2023) how to make this assessment. There is no predetermined tally number for each indicator because the number of tally marks is related both to the deer activity and the length of the survey walk.

An overall Activity Score is derived at the end. The final column of the Tally Sheet is scanned down by the site manager. Usually, the most frequent or dominant score is assigned to the survey area. This may need to be adjusted, because not all indicators may be of equal importance to the site objectives or to the key site features. The site manager may give such indicators extra weighting which would affect the overall Score.

If the walk used each survey remains the same, and the tallying of indicators is consistent, changes in the number of tally marks year on year for a particular feature should form part of the monitoring data.

6.4 Interpretation of the Survey Activity Score

The outcome of the survey will be to assign the survey area to one of the Activity Scores. FC (2023) provide a summary of the interpretation to the four Activity Scores and how this might relate to deer management decisions in woodlands. Below it has been adapted to make it relevant to fens, wet woodlands and peatland, as well as drier woodlands:

> **None or minimal**: Activity at this level presents no problem. Grazing and browsing are not negatively impacting ecological features and may even have some benefit. All features and conservation objectives are withy the site manager's targets. There is no significant damage to assets or peat surfaces. A minimal amount of deer management, or none at all, should be required to maintain this low level of activity.
>
> **Low**: At this level, sensitive features could be at risk. Damage is likely to occur to unprotected coppice, natural regeneration of trees and to fen species, causing localized changes to structure and composition. Sensitive flora may be affected and some species sensitive to habitat change or disturbance may be adversely affected. Some assets on major deer routes could be affected and wetter areas may suffer peat damage. Deer control should be put in place to control activity. Deer numbers should not be allowed to increase and consideration to be given to local deer management groups.
>
> **Moderate**: These scores are associated with clear and sustained damage to sensitive features and loss of biodiversity. If unchecked, activity at this level could result in progressive death of coppice stools, loss of lower coppice layers and bramble thickets with consequent impacts on breeding birds, little or no tree regeneration, and reduction or loss of key flora. In fens, significant structural change may occur, with density and quality of dominants such as reed and sedge degraded. Deer tracks are of sufficient density and size to fragment habitat blocks. Preferential grazing of key species is sufficient to affect long term population size and impact invertebrates that depend on them. There is widespread and severe damage to peat surface with permanent loss of structure and carbon emissions. Assets are frequently damaged, making control of water levels uncertain, risk to water quality and limitations on access and site management. Site management objectives are unlikely to be achieved, Favourable Condition Status is not maintained. Deer control is essential and should be targeted to reduce activity rapidly using collaborative management and deer management groups until scores reduce.

High: This level of activity results in severe damage to many features of the site. If unchecked, biodiversity is severely affected, possibly resulting in irreversible changes to habitat structure and species composition. Only species unpalatable to deer survive. Unprotected coppice stools might be killed within three years, with undershrub layers eliminated with consequent impacts on bird breeding. Reedbeds are degraded and many fen features require specific restoration management to re-establish Favourable Condition Status. Assets are regularly damaged and dysfunctional and significant areas cannot be managed normally. Deer management is essential and should be targeted to rapid reduction in activity. This may require a landscape scale approach involving neighbouring landowners.

6.5 Deer Control and Monitoring

Regular repeated assessments, ideally annually, would become de facto monitoring, as long as the survey route, level of recording effort and consistent tallying of indicators were applied each time. Tracking the Activity Score allows changing impacts to be monitored at the gross scale (e.g. Figure 2). Changes in the number of tally marks year on year for a particular feature allows a much more nuanced monitoring of deer impacts.

This is especially important if deer control is initiated. Continued monitoring is necessary to:

- Determine whether the control measures are being effective.
- Suggest how deer control measures should be stepped-up if the current approach is not effective. What further measures are necessary?
- To provide evidence of a continued need for deer control. This justifies bids for resources to continue/increase control. It may also be needed to explain and advocate for deer control in more contentious situations.
- Develop a landscape scale understanding of the degree, geographic distribution and ongoing nature of deer impacts on wetland habitats.

The latter point requires a high degree of data coordination, central coordination and resourcing of data analysis and dissemination.

With regard to determination of Favourable Conservation Status (FCS) on protected sites, FCS should be evaluated in the context of the impact of deer. The condition assessment should conclude whether or not the site or feature can be in favourable condition with the level of deer damage observable at the time of assessment. Such an assessment could then be used to inform other strategies and initiatives which work towards FCS in the Broads. These could include:

- Future protected sites designation strategies.
- Site objectives for habitat creation or restoration, species conservation or other site management objectives.

- Whether the impacts of deer are acting in combination with other pressures on wetlands including climate change and loss of biodiversity.
- Impacts on success of species recovery.
- Impacts on wider efforts for nature recovery in the Broads.

7. Conclusions

Estimating deer densities from regional censusing data is helpful in identifying the nature and distribution of potential impacts of deer at the landscape scale. Densities of 4-10/km^2 for large deer (Reds and Chinese Water Deer) and 24-50/km^2 for small deer (Muntjac, Fallow) might suggest the need for further investigations.

The February 2024 thermal imaging census showed Reds at 4.5/km^2 and CWD at 7.7/km^2 across the northern Broads, but actual densities in localised habitats would be much higher. Up to 100 CWD/km^2 were recorded locally.

However, reported research suggests censusing data do not reflect the way in which deer use particular habitats, and do not imply a particular level of damage. Consequently, deer census data should be supplemented with assessments of damage to habitats when considering deer management strategies.

In terms of impacts of deer on Broads habitats, the evidence from analysed questionnaires from site managers is consistent with published research:

- Woodlands are strongly impacted with browsing of underwood and grazing of groundflora, especially ferns in damper woodland. Browsing can kill alder coppice regrowth. In drier woodland, impacts reported in the Broads are coincident with those published elsewhere, and are mostly attributed to Muntjac. Impacts on the more treacherous swamp woodlands are not well defined.
- Impacts on fens are significant, especially where there are large herds of Reds in the northern Broads. Almost all sites recorded high impacts with damage from deer tracks and wallows affecting habitat structure and composition with significant damage to fen plant communities. Observations of weaker/thinner reed similar to that documented in the Leighton Moss study were reported in Broads questionnaires.
- Impacts of deer grazing are unclear to many site managers, especially in the context of the roll-out of fen grazing schemes. Deer may be much more selective grazers than stock and therefore may have a disproportionate effect on a small group of favoured species. The overall net impact may need more detailed investigation.
- Deer tracks affect access for management which may reduce practicality of mowing, the area achieved or the frequency of cuts. Some managers note routine management is now “impractical” in deer affected areas. Creation of quagmire conditions can break up hover and impact cattle grazing. Compromising management could have significant contingent impact on fen condition.
- There is impact on aquatic habitat, directly from breaking down dyke- and broad-edge habitat, and indirectly from sedimentation and nutrient release affecting water quality. Invasive non-native species such as *Crassula* can be easily spread by deer.

- Deer tracks open access routes for predators, affecting breeding birds. There can be direct damage to breeding birds from trampling, and indirect impact arising from habitat change. Fen and reedbed specialist breeding birds are especially at risk. Impacts on Bittern have been demonstrated at Leighton Moss. Breeding birds in woodland are also directly affected. Individual plant species are affected, with selective grazing of Milk Parsley by CWD directly recorded, but also other rare plants such as Crested Buckler Fern and Fen Orchid. There are contingent impacts on obligate invertebrates such as Swallowtail.
- Impacts on assets was universally reported. This includes damage to fences, bridges and boardwalks, and to water control structures, sometimes making the latter ineffective or inoperable. Banks and pathways can become inaccessible, affecting visitor and site management infrastructure. Bunds and watercourse banks can be degraded, in some cases causing spills of water and in critical areas, risk of flooding. There are contingent impacts on habitats through lack of water level control or ingress of poor-quality water.
- Damage to the Peat surface is an important impact. At a density of 1500m/ha, an assumed width of 0.3m and depth of 0.3m, a deer track can impact 4.5% of the fen area and destroy 229,500m^3 of peat if scaled up to the 1700ha of fens across the Broads. Most track densities measured in this report greatly exceeded 1500m/ha, affecting up to 11% of sample areas with scaled-up peat destruction probably exceeding 400,000m^3.
- Few positive benefits of deer were noted. Some cited improved structural diversity and the mimicking of grazing by long-extinct large native herbivores, but such benefits are considered density-dependent.
- Calthorpe Broad is the only wetland site that undertakes culling, but numbers taken are moderate and limited by access on the wet peat. Otherwise, all control takes place on adjacent farmland.

In summary, there is little doubt that deer are having a significant impact both directly on habitats and species, and indirectly through degrading key assets and impacting the sustainable management of wetland areas. The evidence regarding impacts of grazing is less clear.

While much of the Broads data is observational, it correlates with published studies and is provided by professional ecologists, site and Estate managers with many years of working on the Broads and observing its ecology. This body of professional opinion and published research is considered robust and of satisfactory quality (Appendix B. Assessing the quality of evidence and confidence in the risk - GOV.UK) in determining risk to designated features and habitats.

A two-stage process of assessment of impact is proposed: Stage 1 initial screening involving mapping of deer tracks and assessing the risk of impact on key site features and Stage 2:

undertaking full impact assessment. The latter uses the standard FC methodology, amended for the Broadland context. Guidance is provided for both stages, with the need for training described.

Stage 1 Screening was undertaken on sample areas at Calthorpe Broad, Sutton Fen, Drakes Fen, Burgh Common, Hickling Hundred Acre Marsh and Surlingham Marshes South. All show varying aspects of deer impact, but all show high levels of deer use – much higher than those recorded at Leighton Moss. For all sites, significant damage to key site features is considered almost certain. It is highly unlikely that the designated features and sites can be maintained in favourable condition under this level of pressure.

The combination of published evidence, evidence from the community of professional opinion and data from the Broads sample sites all evidence the need for immediate action on controlling deer in the Broads. Some sites or circumstances could benefit from Stage 2 assessments where high levels of public sensitivity to deer control is expected.

Stage 1 and Stage 2 assessments both provide methodologies for long-term monitoring of deer activity and impact.

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Appendix 1: Deer Survey Form

Impacts of Deer On Broadland Habitats And Species

Collation of Current Impacts

This survey is intended for:

- Land owners and managers who look after fens, wet woodland, wet grassland or species dependent upon them.
- Owners and managers of property or assets in the floodplain which could be impacted by deer.

The survey asks what evidence there is of impacts. Please could you **describe what evidence you might have so that we could request this if it will help the study**.

Please be as quantitative as possible – numbers and areas of things etc so we can create data from the responses. Expand the spaces and boxes as much as you need.

The data gathered throughout this project will be used by Broads Authority when report writing, contributing to the outputs and deliverables of the FIPL deer evidence assessment project. The data will be used to create a report which will be shared with Natural England and the within FIPL deer project.

Project partners staff (Broads Authority, Natural England, National Trust, Norfolk Wildlife Trust, Suffolk Wildlife Trust, RSPB, Forestry Commission) will be informed by these reports. There would be no further sharing within or outside the Broads Authority, Natural England, National Trust, Norfolk Wildlife Trust, Suffolk Wildlife Trust, RSPB, Forestry Commission without specific consent from individuals.

By submitting this form, you consent to the collection and use of your data as outlined in this privacy notice. However, any published information will be anonymised.

Please return this form by **Friday 15th November.**

1. Respondents Details

Name:

Organisation:

Wetland site:

Best contact details:

2. The Deer

Which species of deer do you have on your site:

Of these, please indicate **which** species you think may be causing a problem:

3. Perceived Damage to Habitats:

Please describe which habitats are affected by deer on your site, and in what way. Please be as specific as possible.

Please distinguish:

Direct impact: e.g. trampling, grazing, wallowing, trackways, breaking hover

Indirect impact: e.g. creating traps for machinery/cattle; interference with grazing

Habitat	**Impact, including area affected.**	
	Direct	**Indirect**
Wet Woodland:		
Fen:		
Wet Grassland		
Aquatic (including small pools, dykes, Broad margins):		

Please describe what **evidence** you could provide to support your comments, if such evidence were asked for to help the study:

Informal/anecdotal:

Hard evidence: Data (monitoring, mapping, photos, direct observation):

4. Perceived Damage to Species:

Please describe which **protected** species are affected by deer on your site, and in what way. Please be as specific as possible.

Direct impact: e.g. damaging nests, trampling, eating flowers/plants.

Contingent impact: e.g. opening routes to nests for predators, disturbance, additionality with grazing

Species	**Impact, including populations affected and trends.**	
	Direct	**Indirect**
Individual Bird Species		
Breeding or wintering assemblages.		
Plants		
Mammals		
Invertebrates (e.g. *Vertigo moulinsiana, Dolomedes plantarius etc*):		
Others:		

Please describe what **evidence** you could provide to support your comments, if such evidence were asked for to help the study:

Informal/anecdotal:

Hard evidence: Data (monitoring, mapping, photos, direct observation):

5. Perceived Damage to Property and Assets:

Please describe which **specific property and assets** are affected by deer on your site, and in what way. Please be as specific as possible.

Direct impact: e.g. trampling, breakage, wallows

Contingent impact: e.g. causing siltation, blockages

Item	Impact, including number/length/quantity affected	
	Direct	**Indirect**
Fences, gates, infrastructure		
Sluices and water level management.		
Monitoring installations		
Paths, banks, bunds		
The surface peat		
Archaeology on your site		
Other assets (specify):		

Please describe what **evidence** you could provide to support your comments, if such evidence were asked for to help the study:

Informal/anecdotal:

Hard evidence: Data (monitoring, mapping, photos, direct observation):

6. Positive Impacts

There may be ways in which deer can be a benefit, e.g. controlling scrub growth, opening up areas for stock to graze, creating open areas in dense fen, diversifying habitat structure and so on.

Please describe any **positive benefits** of deer on your site that you have observed:

Please describe what **evidence** you could provide to support your comments, if such evidence were asked for to help the study:

Informal/anecdotal:

Hard evidence: Data (monitoring, mapping, photos, direct observation):

7. Control Measures

Please summarise what you are doing to manage deer on your site and **if possible, estimate the cost**:

Population management:

Exclusion (fencing etc):

Remedial work – damage repairs, compensatory habitat management, extra species management:

8. Monitoring

Please summarise what monitoring or specific studies are undertaken on your sites:

Deer numbers:

Deer behaviour/usage:

Deer damage/impacts:

9. Return of Responses:

Please return this form by **Friday 15th November** to:

Mike Harding

Mh.hummingbird@btconnect.com

Appendix 2: Deer Survey Tally Sheets. Note that the term Racks equates to Tracks

Broadland Deer Activity Record: Fen and Reedbed						
Date:		Site:		Holding SBI No:		
Recorder:				Distance walked(m):		

Activity trend (circle,↑ =improving)	↑ ↔ ↓			Impact Trend (circle,↑ =improving)	↑ ↔ ↓	
Activity score summary (circle):	H M L N			Impact score summary (circle):	H M L N	

ACTIVITY					Score (N L M H)
Deer seen	TALLY				
Dung	TALLY				
Couches	TALLY				
Scrapes	TALLY				
Wallows	TALLY				
Racks (in Fen)	rarely used	lightly used	frequently used	heavily used	
	TALLY	TALLY	TALLY	TALLY	
Racks (on Paths)	rarely used	lightly used	frequently used	heavily used	
	TALLY	TALLY	TALLY	TALLY	

		IMPACTS				Score (N L M H)
Browsing (Woody shoots eaten)	Coppice<2m (note species)	0-10% browsed, others reaching expected height	11-33% browsed, others reaching expected height	34-66% browsed, average height may be suppressed	67%+ browsed, height suppressed	
		TALLY	TALLY	TALLY	TALLY	
	Live basal shoots on coppice >2m or tree bole	0-10% browsed	11-33% browsed	34-66% browsed	67%+ browsed	
		TALLY	TALLY	TALLY	TALLY	
	Tree seedlings /saplings	no/little browsing, all heights present	<50% browsed, some >50cm	>50% browsed or none/few >50cm	>75% browsed or none/few >30 cm	
	species 1	TALLY	TALLY	TALLY	TALLY	
	species 2	TALLY	TALLY	TALLY	TALLY	
	species 3	TALLY	TALLY	TALLY	TALLY	
	Bramble	large areas at expected height, little browsing, little/no browse line	large patches to expected height, some browsing and /or browse line	most<1.2m, most or all browsed	wisps/most<50cm, most/all browsed	
		TALLY	TALLY	TALLY	TALLY	
Grazing (Fen Flora)	Plant Species (list)	none or little impact	some impact	moderate impact	high impact	
	Reed	TALLY	TALLY	TALLY	TALLY	
	Saw sedge	TALLY	TALLY	TALLY	TALLY	

	Tussock sedges	TALLY	TALLY	TALLY	TALLY	
	Tall herb layer	TALLY	TALLY	TALLY	TALLY	
	Rush layer	TALLY	TALLY	TALLY	TALLY	
	Ground layer	TALLY	TALLY	TALLY	TALLY	
	Species 1	TALLY	TALLY	TALLY	TALLY	
	Species 2	TALLY	TALLY	TALLY	TALLY	
	species 3	TALLY	TALLY	TALLY	TALLY	
Trampling (Flora)	Plant Species (list)	none or little impact	some impact	moderate impact	high impact	
	Reed	TALLY	TALLY	TALLY	TALLY	
	Saw sedge	TALLY	TALLY	TALLY	TALLY	
	Tussock sedges	TALLY	TALLY	TALLY	TALLY	
	Tall herb layer	TALLY	TALLY	TALLY	TALLY	
	Rush layer	TALLY	TALLY	TALLY	TALLY	
	Ground layer/ Bryophytes	TALLY	TALLY	TALLY	TALLY	
	Species 1	TALLY	TALLY	TALLY	TALLY	
	Species 2	TALLY	TALLY	TALLY	TALLY	
	Species 3	TALLY	TALLY	TALLY	TALLY	
Assets Affected	Asset (list)	none or little impact	some impact	moderate impact	high impact	
	Sluices	TALLY	TALLY	TALLY	TALLY	

	Peat	TALLY	TALLY	TALLY	TALLY	
	Culverts	TALLY	TALLY	TALLY	TALLY	
	Banks	TALLY	TALLY	TALLY	TALLY	
	Paths	TALLY	TALLY	TALLY	TALLY	
	Boardwalks/Bridges/Equipment	TALLY	TALLY	TALLY	TALLY	

Comments

Deer and other browsing species present in this area:			Species to which this table relates:		Species causing most impact in this area:	
Trend indicators (circle, ↑ =improving)						
Bramble (palatable) invading/ retreating	Formerly browsed stems with more/ fewer viable shoots	Formerly grazed ground flora with more/less height/cover/ flowers	Activity generally lower/higher than last year(s)	Impacts generally lower/higher than last year(s)		
↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓
COMMENTS: Weather on day and prior to survey: Stand / Habitat type:						

Canopy Cover:

Main species in stand:

Predominant vegetation types

Likely vegetation / regeneration without deer browses

Broadland Deer Activity Record: Woodland

Date:		Site:		Holding SBI No:	
Recorder:				Distance walked(m):	

Activity trend (circle, ↑ =improving)	↑	↔	↓	Impact Trend (circle,↑ =improving)	↑	↔	↓
Activity score summary (circle):	H	M	L	N	Impact score summary (circle):	H	M	L	N

ACTIVITY		Score (N L M H)
Deer seen	TALLY	
Dung	TALLY	
Couches	TALLY	
Scrapes	TALLY	
Wallows	TALLY	

Racks (in wood)	rarely used	lightly used	frequently used	heavily used	
	TALLY	TALLY	TALLY	TALLY	
Racks (edge)	rarely used	lightly used	frequently used	heavily used	
	TALLY	TALLY	TALLY	TALLY	

IMPACTS						Score (N L M H)
Bark removal or breakage	Fraying	TALLY				
	Bark stripping	TALLY				
	Broken stems	TALLY				
Browse line		Not obvious even on ivy	"soft", favoured species only	"hard", not non-favoured spp	"hard", most/all species	
		TALLY	TALLY	TALLY	TALLY	
Browsing (Woody shoots eaten)	Coppice<2m (note species)	0-10% browsed, others reaching expected height	11-33% browsed, others reaching expected height	34-66% browsed, average height may be suppressed	67%+ browsed, height suppressed	
		TALLY	TALLY	TALLY	TALLY	
	Live basal shoots on coppice >2m or tree bole	0-10% browsed	11-33% browsed	34-66% browsed	67%+ browsed	
		TALLY	TALLY	TALLY	TALLY	

	Tree seedlings /saplings	no/little browsing, all heights present	<50% browsed, some >50cm	>50% browsed or none/few >50cm	>75% browsed or none/few >30 cm	
	species 1	TALLY	TALLY	TALLY	TALLY	
	species 2	TALLY	TALLY	TALLY	TALLY	
	species 3	TALLY	TALLY	TALLY	TALLY	
	Bramble	large areas at expected height, little browsing, little/no browse line	large patches to expected height, some browsing and /or browse line	most<1.2m, most or all browsed	wisps/most<50cm, most/all browsed	
		TALLY	TALLY	TALLY	TALLY	
Grazing (Flora)	Plant Species (list)	none or little impact	some impact	moderate impact	high impact	
	Ferns	TALLY	TALLY	TALLY	TALLY	
	Bluebells	TALLY	TALLY	TALLY	TALLY	
	Sedges	TALLY	TALLY	TALLY	TALLY	
	species 4	TALLY	TALLY	TALLY	TALLY	
Trampling (Flora)	Plant Species (list)	none or little impact	some impact	moderate impact	high impact	
	Ferns	TALLY	TALLY	TALLY	TALLY	
	Bryophytes	TALLY	TALLY	TALLY	TALLY	
	Ground community	TALLY	TALLY	TALLY	TALLY	
	species 4	TALLY	TALLY	TALLY	TALLY	

Assets Affected	Asset (list)	none or little impact	some impact	moderate impact	high impact	
	Sluices	TALLY	TALLY	TALLY	TALLY	
	Peat	TALLY	TALLY	TALLY	TALLY	
	Culverts	TALLY	TALLY	TALLY	TALLY	
	Banks	TALLY	TALLY	TALLY	TALLY	
	Paths	TALLY	TALLY	TALLY	TALLY	
	Boardwalks/Bridges/Equipment	TALLY	TALLY	TALLY	TALLY	

Comments

Deer and other browsing species present in this area:			Species to which this table relates:		Species causing most impact in this area:	
Trend indicators (circle, ↑ =improving)						
Bramble (palatable) invading/ retreating	Formerly browsed stems with more/ fewer viable shoots	Formerly grazed ground flora with more/less height/cover/ flowers	Activity generally lower/higher than last year(s)	Impacts generally lower/higher than last year(s)		
↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓	↑ ↔ ↓
COMMENTS: Weather on day and prior to survey:						

Stand / Habitat type: Canopy Cover: Main species in stand: Predominant ground vegetation Likely vegetation / regeneration without deer browse