Site-based practical conservation combining science and practical experience: Chippenham Fen

Report by Vanessa Cutts, Nigel G. Taylor & William J. Sutherland

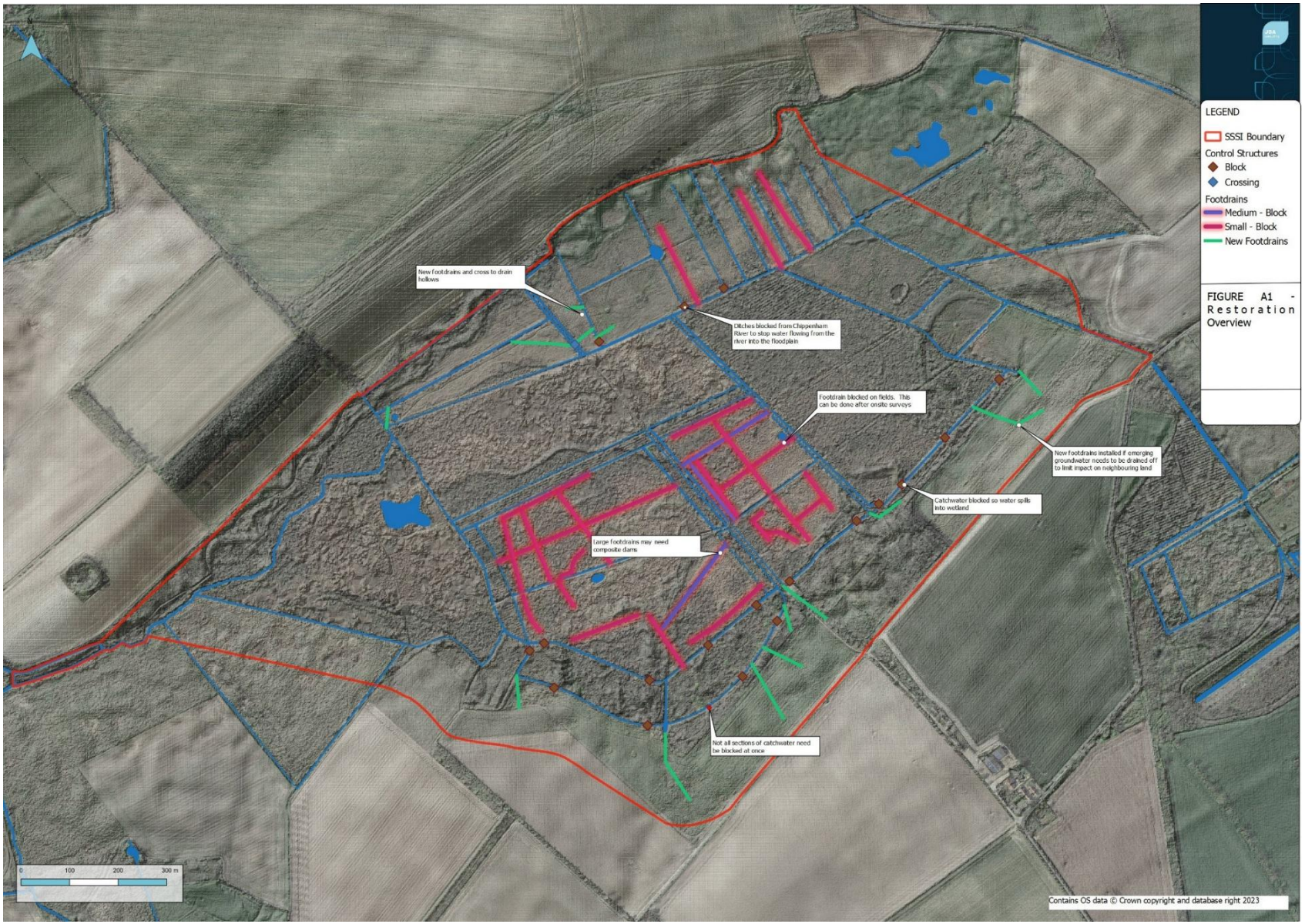
Based around a field visit 5th June 2023

This document summarises the topics discussed during a visit to Chippenham Fen, hosted by reserve managers Chris Hainsworth and Mike Taylor (Natural England). The site at Chippenham is described along with proposed management actions, with inputs and suggestions from other attendees highlighted with an asterisk (*). Evidence from literary sources is provided in green boxes.

This is not a detailed synthesis or comprehensive review, but rather an attempt to combine knowledge from experienced, local land managers with evidence from the Conservation Evidence database (www.conservationevidence.com) and other sources.

Attendees:

Chris Hainsworth	*Natural England*	Jo Finlow	*WT Lincolnshire*
Mike Taylor	*Natural England*	Kate Carver	*WT BNC*
Joe Martin	*Farmer*	Norman Sills	*Retired RSPB*
Jo Thomas	*WWT*	Mike Edwards	*Albanwise Environment*
Charlie Kitchin	*RSPB*	Pamela Abbott	*Natural Cambridgeshire*
Nicholas Watts	*Farmer*	Catherine Weightman	*Natural England*
Craig Taylor	*Farmer*	Jack Shutt	*University of Cambridge*
Sarah Taylor	*Farmer*	Bill Sutherland	*University of Cambridge*
Alan Kell	*Wicken Fen NT*	Nigel Taylor	*University of Cambridge*
Glenn Anderson	*Wendling Beck Project Lead*	Vanessa Cutts	*University of Cambridge*



Map of Chippenham Fen

Introduction

Chippenham Fen NNR is 115 ha and sits within a larger SSSI of 150 ha. It is located within a very shallow valley with the headwaters at Chippenham stream and is fed by spring water from chalk aquifer. There are a series of ditches. Water flows into the catchwater ditch before being channelled around the site but it is difficult to keep water in the middle of the fields. The site is fairly wet all winter, but the water drops in the summer (>1 m below ground surface in some places). Chippenham have applied for a peatland grant scheme to keep the site wetter for longer, especially during the summer (i.e. make the water-level graphs 'less spiky').

There is some deep peat at Chippenham. Most of the peat is >30 cm deep, with odd areas reaching >1 m deep. Most of the peat scores high on the Von Post scale (7–10). The Von Post humidification scale measures the degree of decomposition of dead plant matter: 1 = undecomposed; 10 = colloidal/completely decomposed (Table 1).

Overall aim at Chippenham: To slow the flow of water through the site by blocking drains and footdrains. In particular, to block the catchwater ditch, which intercepts water arriving on site and channels it around and off the site. Blocking ditches will force the water to mover through the soils and over the site.

*What about a reservoir? This would store surplus water in winter and may help resilience to climate change (drier summers).

Pictured above is an area at Chippenham. The aim is to have more of the site looking like this.

Table 1. Systematic outline of the Von Post Humidification scale. Source: Wijeyesekera et al. (2016) Embedded Empiricisms in Soft Soil Technology. IOP Conference Series: Materials Science and Engineering, 136.

Degree of Humification (VON_POST)	Decomposition	Plant structure	Amorphous material	Colour of released water	Escape of material on squeezing	Nature of residue
H1	None	Easily identified	None	Clear	None	
H2	Insignificant	Easily identified	None	Clear or yellowish	~	
H3	Very slight	Still identifiable	~	Muddy brown	~	Not pasty
H4	Slight	Not easily identifiable	Very slight amount	~	None	Somewhat pasty
H5	Moderate	Recognizable but vague	~	~	Very small amount	~
H6	Moderately strong	Indistinct	~	~	About one third escapes	Fibres and roots more resistant to decomposition remain in hand
H7	Strong	Very faintly recognizable	Lots	Very dark and almost pasty	About one half escapes	
H8	Very strong	Very indistinct	Large quantity	~	About two thirds escape;	
H9	Nearly complete	Almost undiscernable	~	~	~	
H10	Complete	Not discernable	~	~	All the wet peat escapes	

At the catchwater ditch

Chippenham fen is currently around two thirds fen and one third woodland. There were attempts to drain the fen and tame the water course in the past. The current plan is to block the catchwater ditch in around six different places. Trees were planted years ago (there are a number of trees close to the ditch). The trees have not been felled because of the bird fauna – Breeding Bird Assemblage is part of the SSSI designation. In later years the value of the woods for woodcock has been recognised, a species in steep decline nationally.

*The trees suck up the water from the ground and increase evapotranspiration. Raising the water level will likely kill off the trees, which could be easier than felling.

*Where to get spoil from to fill the ditch? There are concerns that Chippenham peat won't be suitable for creating dams.

> *One option would be to fell the trees into the ditch. Some are already falling over and it's not good quality timber anyway and it would be expensive to extract from such a wet site. Vegetation will grow over the top of the felled trees.
>
> *Borrow pits could become scrapes/ponds. These might also contribute to regulation of water levels.
>
> *Hay from the Fen could be used to create dams (currently stacked elsewhere on site). Uncertain how this would affect GHG emissions or the water pH.

*Is there value to the open water that may be lost (e.g. as invertebrate habitat)? And value in the carbon stored in the trees?

*We discussed the option of removing peat so the surface is closer to the water table (unclear what would happen with leftover peat). Another option could be excavating peat and chalk, then filling the peat back in (effectively removing 1 m or so of chalk, bringing the peat surface down to meet the water table).

*We also discussed the potential to invert peat (burying surface peat, with undesirable plant rhizomes, under deeper peat layers). This has been done at Titchwell to reset succession: takes 7–10 years for reeds to encroach again.

*At Holme Fen the peat is so oxidised, the water only moves a few cm. Therefore, it does not function as peat because water does not move through it!

Evidence for raising the water level

Managing the water level is generally good for wetland characteristic plants. Raising the water level increases their prevalence and abundance [1, 2]. Most studies report increases in sedge and reed cover [2]. Fluctuating the water level can be beneficial for marsh vegetation (although two out of ten studies reported a decrease in species richness), for example, emergent vegetation can develop after lowering the water level, provided that there is a nearby seed source to colonize [3].

Managing the water level is also beneficial for birds, but this depends on the target species [3]. One study in the USA reported the highest bird diversity at average depths of 10–20 cm in wetlands [4]. A study in the UK reported that male bitterns established territories earlier when water levels were higher (19–27 cm) than lower (4–9 cm) but water level management did not affect productivity or chick survival [5].

Will raising the water level kill the trees? According to the Conservation evidence database, seven studies found a decrease in tree/shrub cover after rewetting, six studies reported no effect on tree/shrub over and two studies found that tree/shrub cover increased [2]. Evidence suggests that cutting or removing trees benefits herbaceous species and characteristic wetland plants, but overall species richness does not always increase [2].

Adding woody debris to rivers can have positive effects on aquatic flora and fauna, but can felled trees create a dam? In one example, felled trees were used to reduce the width of a river channel, whereby sediment build up led to vegetated 'benches' on the margins [6]. Using hay from the Fen was suggested as an alternative but there is no conclusive evidence as to how this effects water quality [7].

Sources:

1. Taylor, N.G., Grillas P., Smith R.K. & Sutherland W.J. (2021) *Marsh and Swamp Conservation: Global Evidence for the Effects of Interventions to Conserve Marsh and Swamp Vegetation*. Conservation Evidence Series Synopses. University of Cambridge, Cambridge, UK.

   →Raise water level to restore degraded marshes: www.conservationevidence.com/actions/3026
   →Raise water level to restore/create marshes from other land uses: www.conservationevidence.com/actions/3198
   → Actively manage water level: www.conservationevidence.com/actions/3038

2. Taylor, N.G., Grillas, P. & Sutherland, W.J. (2020) Peatland Conservation. Pages 367-430 in: W.J. Sutherland, L.V. Dicks, S.O. Petrovan & R.K. Smith (eds) *What Works in Conservation 2020*. Open Book Publishers, Cambridge, UK.

   → Rewet peatland: www.conservationevidence.com/actions/1756;
   → Cut/remove/thin forest plantations and rewet peat: www.conservationevidence.com/actions/1732

3. Williams, D.R., Child, M.F., Dicks, L.V., Ockendon, N., Pople, R.G., Showler, D.A., Walsh, J.C., zu Ermgassen, E.K.H.J. & Sutherland, W.J. (2020) Bird Conservation. Pages 137-281 in: W.J. Sutherland, L.V. Dicks, S.O. Petrovan & R.K. Smith (eds) *What Works in Conservation 2020*. Open Book Publishers, Cambridge, UK.

4. Taft, O.W., Colwell M.A., Isola C.R. & Safran R.J. (2002) Waterbird responses to experimental drawdown: implications for the multispecies management of wetland mosaics. *Journal of Applied Ecology*, 39, 987-1001.

5. Gilbert, G., Tyler G.A., Dunn C.J., Ratcliffe N. & Smith K.W. (2007) The influence of habitat management on the breeding success of the great bittern *Botaurus stellaris* in Britain. *Ibis*, 149, 53-66.

6. Harvey G.L, Henshaw A.J, Parker C., Sayer C.D. (2018) Re-introduction of structurally complex wood jams promotes channel and habitat recovery from overwidening: Implications for river conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 28: 395– 407.

7. McHargue, E. & Gillan C. (2020) The Effects of Barley Straw (Hordeum vulgare) Extract and Barley Straw Pellets on Algal Growth and Water Quality. Journal of Emerging Investigators, 2, 1–8.

Evidence for creating ponds

Ponds are beneficial for birds, with studies reporting increases visitation and foraging rates after pond creation. One study showed the creation of ponds increased the number of breeding pairs of Snipe *Gallinago gallinago* [2], while another reported that lapwing chick *Vanellus vanellus* condition was higher in sites with footdrains [3].

Ponds benefit amphibians by providing breeding habitat. There are a number of examples of successful translocation, as well as natural colonisation of created ponds [4]. Vegetation cover around ponds can influence their presence. Fewer emergent vegetation reduces shading and the presence of submerged and floating vegetation provides egg laying/foraging sites [4].

Freshwater marsh vegetation will colonise naturally [5]. Note: Initially excluding grazers from pond margins after creation may help marginal vegetation to establish (particularly as water buffalo graze on reeds) [6]. Aquatic vegetation can colonise naturally, anytime from four months to two years [unpublished CE synopsis].

Sources:

1. Williams, D.R., Child, M.F., Dicks, L.V., Ockendon, N., Pople, R.G., Showler, D.A., Walsh, J.C., zu Ermgassen, E.K.H.J. & Sutherland, W.J. (2020) Bird Conservation. Pages 137-281 in: W.J. Sutherland, L.V. Dicks, S.O. Petrovan & R.K. Smith (eds) *What Works in Conservation 2020*. Open Book Publishers, Cambridge, UK.

   → Create scrapes and pools in wetlands: www.conservationevidence.com/actions/359

2. Holton N. & Allcorn R.I. (2006) The effectiveness of opening up rush patches on encouraging breeding common snipe *Gallinago gallinago* at Rogersceugh Farm, Campfield Marsh RSPB reserve, Cumbria, England. *Conservation Evidence*, 3, 79-80.

3. Squires R. & Allcorn R.I. (2006) The effect of chisel ploughing to create nesting habitat for breeding lapwings *Vanellus vanellus* at Ynys-Hir RSPB reserve, Powys, Wales. *Conservation Evidence*, 3, 77-78.

4. Smith, R.K., Meredith, H. & Sutherland, W.J. (2020) Amphibian Conservation. Pages 9-64 in: W.J. Sutherland, L.V. Dicks, S.O. Petrovan & R.K. Smith (eds) *What Works in Conservation 2020*. Open Book Publishers, Cambridge, UK

   → Create ponds: www.conservationevidence.com/actions/869

5. Taylor N.G., Grillas P., Smith R.K. & Sutherland W.J. (2021) *Marsh and Swamp Conservation: Global Evidence for the Effects of Interventions to Conserve Marsh and Swamp Vegetation*. Conservation Evidence Series Synopses. University of Cambridge, Cambridge, UK.

   → Excavate freshwater pools: www.conservationevidence.com/actions/3211

6. Wiegleb, G. & Krawczynski, R. (2010) Biodiversity management by water buffalos in restored wetlands. *Waldökologie, Landschaftsforschung und Naturschutz* 10, S17–S22.

At the Cambridge Milk Parsley (CMP) meadow

This is the best site in Britain for Cambridge milk parsley *Selinum cariflora*. There have been counts of the flowering plants at Chippenham since 1988, which have been annual and more intensive since 2008. There has been an upward trend in CMP in recent years. It occurs mostly in slightly higher, drier areas. The buffalo avoid CMP, grazing around it. The plan at Chippenham is to make the site wetter in the summer but could this have negative effects on CMP?

*The proposed water regime change is in opposition to CMP needs.

*Raising the water table will create access issues. A solution to this would be to create a raised bank ca. 20–50 m wide. This would create a track for vehicles with space for CMP alongside.

*Use dipwells to understand the water levels and why they have changed.

*Turf ponds: can they help regulate the water level?

Evidence for Cambridge milk Parsley *Selinum carvifolia*:

In the UK, CMP only occurs in Cambridgeshire (Sawston Hall, Snail Well Meadows and Chippenham) but it is widespread in Europe [1, 2, 3].

Cambridge milk parsley needs a continuous water supply, but in free-draining land with a fluctuating water table [4]. Once mature, it can compete with other species provided that ground conditions do not become waterlogged [3]. CMP does not disperse well, its seeds falling close to the plant [3]. It is thought that a reduction in grazing and lowering of the water table have contributed to its decline [2].

Creating a raised bank: large earth movements might be tricky if there is sensitive archaeology. Nothing is known from desk studies, but it is likely there are 'unknown unknowns'.

Sources:

1. *Selinum carvifolia* (L.) L. in GBIF Secretariat (2022). GBIF Backbone Taxonomy. Checklist dataset https://doi.org/10.15468/39omei accessed via GBIF.org on 2023-06-07.
2. Cadbury & Mountford (2007) The impact of a lack of grazing and lowered water-table on Cambridge Milk-parsley (*Selinum carvifolia*) and other plants at Sawston Hall Fen, Cambridgeshire. *Nature in Cambridgeshire*, 49, 11–20.
3. Cadbury (2009) Cambridge Milk-parsley (*Selinum carvifolia*) needs a helping hand in Cambridgeshire. *Nature in Cambridgeshire*, 51, 287–33.
4. Fitter, A.H. & Peat, H.J. (1994) The Ecological Flora Database. *Journal of Ecology*, 82, 415–425.

Silver barred Moth *Deltote bankiana* (SBM)

SBM was first found at Chippenham in 1882. Wicken Fen and Chippenham Fen have the largest breeding populations. Although not a day-flying species, they can be easily disturbed. Since 2000, there has been an upward trend in the population.

Both CMP and SBM used to be present in the north meadows, north of the Chippenham stream but have disappeared from that area. Purple moor grass still occurs there and the buffalo graze there. Why is this? Are they just clinging remnants? The area is wetter in the winter than it used to be.

*Could this be caused by a change in the temperature from clearing woodland?

* Is it worth investing in SBM conservation if it is just a clinging remnant at the edge of its range (and is abundant elsewhere)? What were the species and communities present at Chippenham in a more natural (wetter) state? Is this what we're aiming for? What can we expect in this condition?

Evidence for silver barred moth:

In the UK, the silver barred moth (SBM) occurs only in Cambridgeshire and Norfolk but is widespread across Europe [1].

SBM feeds on purple moor grass *Molina caerulea*, which requires a continuous water supply, in free-draining land with a fluctuating water table (similar conditions as CMP) [2]. It grows poorly in stagnant, water-logged soils [3]. SBM also feed on smooth meadow-grass *Poa pratensis*, which requires free-draining land [2]. SBM cocoons close to the ground for overwintering [4] so could be vulnerable to higher water levels.

There are no actions in the Conservation Evidence database that specifically target SBM. However, in general, moths and butterflies respond positively or neutrally to wetland restoration (i.e. blocking ditches and raising the water table) but two studies found that egg survival was lower in restored wetlands, despite being used more by lepidopterans overall [5].

Sources:

1. *Deltote bankiana* (Fabricius, 1775) in GBIF Secretariat (2022). GBIF Backbone Taxonomy. Checklist dataset https://doi.org/10.15468/39omei accessed via GBIF.org on 2023-06-07.

2. Fitter, A.H. & Peat, H.J. (1994) The Ecological Flora Database. *Journal of Ecology*, 82, 415–425. http://www.ecoflora.co.uk

3. Meade, R. ed. Managing Molinia? Proceedings of a 3 day conference 14-16 September 2015 in Huddersfield, West Yorkshire, UK. (2016) Access to Evidence: Natural England, UK.

4. Kimber, I. (2023) "*73.027 BF2413 Silver Barred Deltote bankiana*". UKMoths. Retrieved 07 September 2023. www.ukmoths.org.uk/species/deltote-bankiana/.

5. Bladon A.J., Smith R.K. & Sutherland W.J. (2022) *Butterfly and Moth Conservation: Global Evidence for the Effects of Interventions for butterflies and moths*. Conservation Evidence Series Synopsis. University of Cambridge, Cambridge, UK.

   → Restore peatlands: www.conservationevidence.com/actions/3948
   → Restore wetlands: www.conservationevidence.com/actions/3949
   → Install artificial dams: www.conservationevidence.com/actions/3954

At the 40 acre wood

Chippenham contains a large wood of 40 acres. Should this wood be kept? The trees cannot be felled because the estate control the timber licence. The wood is home to one of the best breeding woodcock populations, with at least 6–10 roding males (a slight dip this year but generally the population is stable/increasing). Resident woodcock are declining nationally. There are no nightingales or Cetti's warblers at Chippenham, whereas both occur at Wicken. The wood is full of muntjac and ground flora are few due to overgrazing. Roe deer pass through occasionally but are not resident. There are no Chinese water deer.

*Could the area of woodland be reduced, as a compromise? Although, if the woodland becomes too small, it loses much of its value (e.g. for woodcock).

*With the planned changes in water regime, the wood might disappear anyway, if it's too wet.

*Wet scrub is still part of the fenland habitat (e.g. willow, alder). One option could be to encourage wetland tree species.

*There is some debate about its effects of evapotranspiration.

*At Wicken, the peat shrank around 20 cm more in scrub area than in open fen.

*Red deer or water buffalo could be fenced in. Their disturbance and browsing might speed up transition to Fen.

* Increases in deer populations have been noted at Pymoor and Godmanchester.

Evidence for woodcock

Given that the woodcock population is declining nationally but is stable/increasing at Chippenham, advice would be to identify their ecological requirements locally (e.g. habitat preferences, breeding sites) to inform other conservationists [1].

Existing evidence suggests that woodcock prefer large, continuous, and diverse woodlands (>30 ha), away from urban areas [2, 3]. Management techniques that increase the stand age structure and shrub diversity (e.g. thinning trees, creating nearby glades for roding males, retaining mature stands) are likely to benefit woodcock [3].

Sources:

1. Sutherland, W. (2022) Transforming conservation: a practical guide to evidence and decision making. Cambridge: Open Book Publishers.

2. Brewin, J., Hoodless, A.N., Heward, C.J. and Hopgood, A. (2022) Conserving Our Woodcock: Research-based measures to help the UK's resident population. Game & Wildlife Conservation Trust, Fordingbridge.

3. Heward, C.J., Hoodless, A.N., Conway, G.J., Fuller, R.J., MacColl, A.D.C. & Aebischer, N.J. (2018) Habitat correlates of Eurasian Woodcock *Scolopax rusticola* abundance in a declining resident population. *Journal of Ornithology* 159: 955–965.

*Thoughts on beavers?

*There are approximately 160 in UK. Natural England are giving out licences, but DEFRA have paused investment.

*They require a proper fence but this is very expensive (>50 ha is ~ £300,000)

*Beavers would dig channels into the wood to fell trees but is there enough flow in the ditches?

*Spains Hall estate, Finchingfield, has beavers (https://www.spainshallestate.co.uk/).

*Beavers in the Fens are possibly not a good idea and they could block drainage channels and dig holes in embankments. Generally not wanted in the Fens by local people.

At the north meadow with the water buffalo

Note: this is the area where CMP and SBM used to occur. Behind the meadow is higher ground, beyond which is owned by Trinity college.

The water buffalo are 19–23 years old. Three of them came from a herd in Wales. They are very hardy. A bid has been made to buy more, young buffalo. The plan is to keep them until the older buffalo die, then get rid of all buffalo. The buffalo dug up and ate and entire population of saw-sedge! However, they do avoid grazing CMP.

> *Buffalo are good at controlling scrub. Also keeping ponds and ditches open through disturbance.
>
> *Is it possible to have a mix of buffalo and cows/ponies?

In order to reduce drainage, Chippenham have installed (or are planning to?) 1-m wide plastic shuttering. Plastic is cheaper than wood, and easier to install.

> *There were some concerns over adding plastic to environment. Suitable alternatives include fibreboard (made from Typha spp.), clay, peat from elsewhere on site (but this might not structurally suitable).

*An unmanaged fen is better for carbon storage, but bad for plant diversity. There were suggestions that biodiversity concerns, in an internationally important site for biodiversity, should trump carbon concerns.

*A site-wide solution/idea: move the woodlands to the edge of the site, while keeping the fen in the centre. However, this assumes that the woodland in the centre can be removed/fall naturally. If not, Chippenham would became majority woodland!

Buffalo	Cows
Selective grazers (avoids CMP)	Less selective grazers (will graze CMP)
Browse reeds and woody plants	Cannot digest reeds. Avoids tussock vegetation.
Can access deep water	Limited access to pools. Struggles with steep slopes.
Graze black alder *Alnus glutinosa*	Avoids black alder *Alnus glutinosa*
Trample vegetation	Trample vegetation
Can roam outside and graze all year round	Requires winter feeding
Robust to disease	Disease prone in wet sites. Hooves need checking.

Evidence for water buffalo

Water buffalo can graze reed and alder (unlike cattle), therefore they acts as good reed management for wading birds [1, 2]. In a wetland in Greece, buffalo grazing was reported to be more effective at controlling reeds than a combination of cutting and grazing [3].

Buffalos wallow, creating or deepening existing pools. For example, in a site in Germany, five buffalos created four 27–152 m^2 wallows within three months [1]. Their trampling creates submerged tracks, which have the potential to provide fish with dispersal routes and subsequently feeding habitat for bittern [4].

In general, the effects of grazing wetlands are mixed in terms of herb cover, peatland-characteristic plants and overall plant richness and diversity [5, 6]. The effects are context-dependent, depending on the initial site conditions, exact vegetation type, species and timing of grazing.

Sources:

1. Wiegleb, G., & Krawczynski. R. (2010) Biodiversity management by water buffalos in restored wetlands. *Waldökologie, Landschaftsforschung und Naturschutz* 10**,** S17–S22.

2. Duncan P., Grillas P., Taylor N., Lecomte T. (2021) La restauration et la gestion des milieux tourbeux alcalins – utilisation du pâturage. Rapport de synthèse, projet LIFE 18NAT/FR/000906.

3. Kazoglou, Y.E., Mesléard, F., Papanastasis, V.P. (2004) Water buffalo (*Bubalus bubalis*) grazing and summer cutting as methods of restoring wet meadows at Lake Mikri Prespa, Greece. Land use systems in grassland dominated regions Proceedings of the 20th General Meeting of the European Grassland Federation, Luzern, Switzerland, 21-24 June 2004: 225–227.

4. Gulickx M.M.C., Beecroft R.C. & Green A.C. (2007) Introduction of water buffalo *Bubalus bubalis* to recently created wetlands at Kingfishers Bridge, Cambridgeshire, England. *Conservation Evidence*, 4, 43-44.

5. Taylor N.G., Grillas P., Smith R.K. & Sutherland W.J. (2021) *Marsh and Swamp Conservation: Global Evidence for the Effects of Interventions to Conserve Marsh and Swamp Vegetation*. Conservation Evidence Series Synopses. University of Cambridge, Cambridge, UK.

   → Use grazing to maintain or restore disturbance in mashes: www.conservationevidence.com/actions/3050

6. Taylor, N.G., Grillas, P. & Sutherland, W.J. (2020) Peatland Conservation. Pages 367-430 in: W.J. Sutherland, L.V. Dicks, S.O. Petrovan & R.K. Smith (eds) *What Works in Conservation 2020*. Open Book Publishers, Cambridge, UK.

   → Use grazing to maintain or restore disturbance in peatland: www.conservationevidence.com/actions/1762