BBOWT Wild Oxford Project
Chilswell Valley

Report on the fourth and fifth years
March 2018 to May 2019

Dr Judith A Webb
Ecological Consultant
2 Dorchester Court
Blenheim Road
Kidlington
Oxon OX5 2JT
Website: http://judithwebb.weebly.com/

Chilswell Valley – view to east, down the valley over the limestone grassland at cowslip time 05.05.2018

July 2019

C O N T E N T S

All photographs in the following report are my own unless otherwise indicated

GENERAL INTRODUCTION AND AIMS OF THE WILD OXFORD PROJECT

The Wild Oxford Project is a collaborative initiative of BBOWT and Oxford City Council (OCC) grant-funded by a local charitable trust.

Its aims are to:

- Introduce local people to the wildlife on their doorstep
- Enable local people to take an active role in enhancing and protecting the sites
- Deliver improvements to the fen and other key habitats.

BBOWT WILD OXFORD PROJECT AT CHILSWELL VALLEY

Introduction and background

Chilswell Valley is well-named locally as 'Happy Valley', as for a wildlife enthusiast it has small areas of nearly everything – dry, flowery, limestone grassland with steep south-facing and north-facing sections, ancient woodland of oak and hazel on steep limestone, rare calcareous, alkaline, tufa-forming fen with reed on peat and a tufa-forming stream.

This valley in South Hinksey Parish was donated to Oxford City Council (OCC) by deed of gift in autumn 1937 by the 'Oxford Trust', which was a forerunner of the current Oxford Preservation Trust. A condition of the deed of gift was that '**The land be dedicated permanently as public open space'**.

Most of the 6.3-hectare section of the valley now so managed by OCC has been designated a Local Wildlife Site, referred to as **'Chilswell Valley and Copse, 50B02'** by Thames Valley Environmental Records Centre (TVERC), in recognition of its county importance for wildlife. The LWS centre's Ordnance Survey grid reference is SP508035.

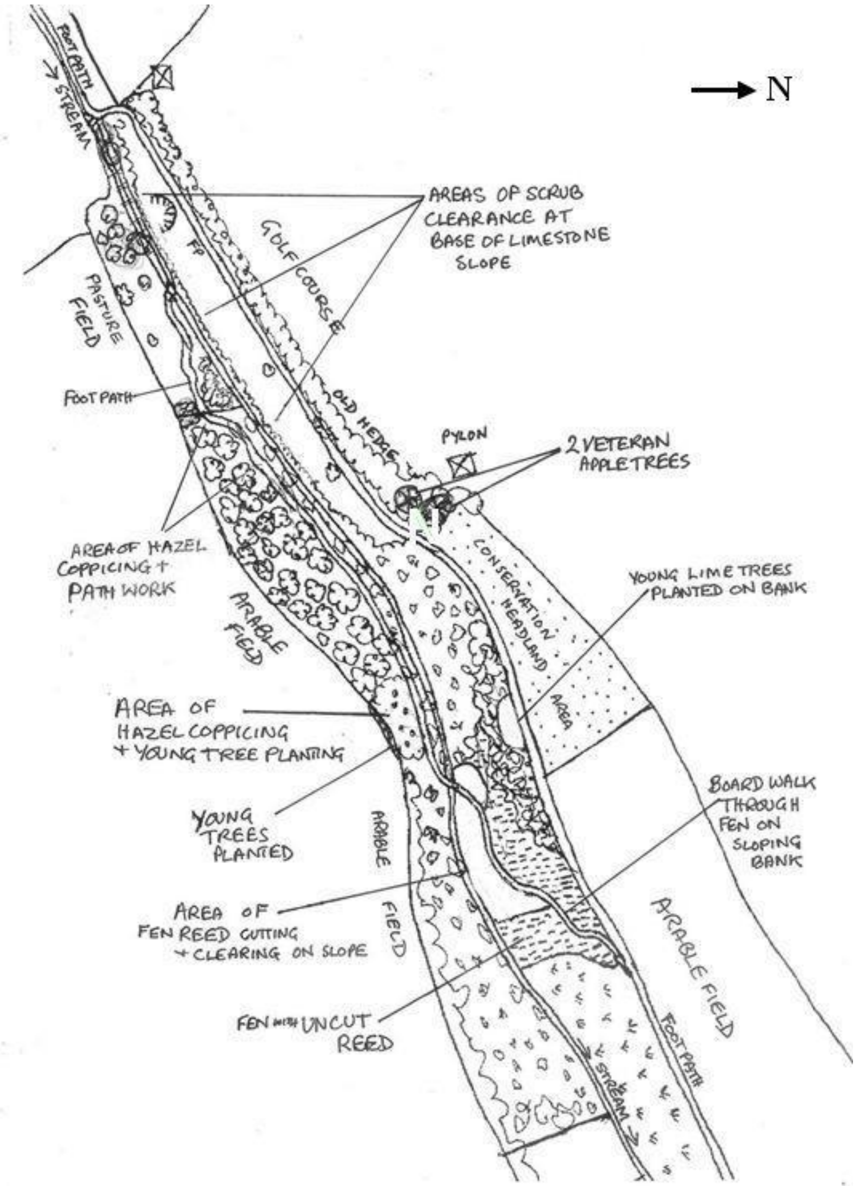
- A table of **records of species found at Chilswell Valley from 24 March 2018 to 13 April 2019** in specific surveys is presented in **Appendix 1** (separate document).

- For further **background information** on the history of the site and **much fuller discussion** of its habitats, species and management, please see my reports and species lists for the first three years of the Wild Oxford project, 2014-2015 , 2015-2016 and 2016-2017.

  Appendices to these previous reports include tables of **all species recorded in my surveys from 2008 to 13 January 2018.**

Figure 1:

Sketch map indicating the various habitat types in the valley and the areas of Wild Oxford Project work



At Chilswell, since the start of the Wild Oxford project in 2014, the following potential habitat enhancements have been identified:

A. Alkaline fen restoration

Chilswell Valley contains a relic, rare, valuable, calcareous, alkaline fen, which has been overtaken by common reed due to lack of sufficient management since the cessation of grazing. Natural succession has also resulted in the invasion of patches of scrub comprising willows and guelder rose.

Whilst some of this monoculture reed habitat could be left for specific birds and invertebrates, other areas could have scrub removed and regular reed cutting and raking to return it to the short turf vegetation type typical of when it had rough, extensive, grazing. This would increase plant diversity and benefit fen insects that like open, warm, short vegetation. It is possible that eventually some extension of grazing from the grassland area, currently lightly grazed by cattle, to the fen land would be beneficial to these newly-restored short-vegetation areas. In the absence of grazing the fen will need at least an annual cut and rake.

B. Limestone grassland area extension

At the west end of the site, the steep limestone grassland on the northern valley side is very important for attractive, sun-loving, wildflowers that provide nectar and pollen as food for many invertebrates. Because of its very favourable south-east-facing aspect it receives much sunshine from morning to evening. This favours sun-loving flowers and the high temperatures produced favour the life cycles of invertebrates, including butterflies, bees, moths, flies, ants, grasshoppers and scarce snails, such as the heath snail *Helicella itala*.

The steep limestone grassland on the southern valley side is north-west facing and thus rarely gets full sun, so it is a contrasting cooler, shadier, damper, grassland habitat favoured by different plant and invertebrate species. Such a variation in physical conditions plays an important role in creating the grassland habitat mosaic in this relatively small area. Autumn-to-spring grazing by cows has previously maintained the floristic diversity in the grassland area.

Encroaching scrub and hawthorn trees at the bottom of the slope were reducing the flowery grassland area. Scrub removal and tree coppicing were identified as helpful to extend the valuable area of limestone flora that is exposed to the light and warmth of the sun. The small overgrown quarry at the eastern end of the south-east-facing grassland was a focus for work, as exposure of bare limestone rocks would give a valuable sunny basking area for butterflies, such as the common blues and marbled whites.

A number of plants in the grassland have conservation status. Nationally-rare plants, such as basil thyme *Clinopodium acinos*, and locally very uncommon ones, such as wild liquorice *Astragalus glycyphyllos*, sainfoin *Onobrychis viciifolia* and large thyme *Thymus pulegioides*, are still in the grassland in small amounts; however, to extend their populations and give them a more secure future on site, these species need an increase in the area of ground that is suitable for them.

The following species in this grassland are now on the England Red List[1] with Near Threatened status: hoary plantain *Plantago media*, common rockrose *Helianthemum nummularium,* field scabious *Knautia arvensis*. Quaking grass *Briza media* (on old grassland site lists but not yet re-found) is also on the England Red list as Near Threatened.

---

[1] Botanical Society of Britain and Ireland, *A Vascular Plant Red List for England* (updated 18.11.2014).

Common rockrose, Helianthemum nummularium

Field Scabious, Knautia arvensis – photo taken by Ian Esland

The limestone rocks currently exposed in the small quarry have interesting lichens and mosses.

Clearing vegetation out of the quarry and returning some of this site to bare rock would benefit total site biodiversity with regard to these smaller species, as well as providing sunning/basking opportunities for animals.

C. Restoration of the ancient woodland on the north-west facing limestone banks

The woodland on this steep north-west-facing bank is always cool because of the aspect. The trees comprise pedunculate oaks and ash with hazel coppice. The ground flora features wood anemone, bluebell and wood sanicle, plus celandines in the wetter bottom of the valley. Before the start of the Wild Oxford project the hazel coppice stools present in this area were becoming mature with thick trunks, and many collapsed. Shade was dense, probably the reason for the disappearance of some of the ancient woodland indicator ground flora species, such as greater stitchwort and climbing corydalis, which are no longer seen in this area. These species have long-lived seed and we may yet get them back by disturbance and letting in more light. Some re-coppicing and glade creation was identified as likely to enable recovery of ground flora to its historic abundance and diversity. This would certainly ensure better flowering of the bluebells, anemones and wood sanicle already present.

Sparsely flowering bluebells in the copse next to the path in May 2018

Many of the mature pedunculate oak trees on this steep north-west-facing bank have died and fallen. No natural oak regeneration is happening and the only seed germination is of ash, so without intervention the woodland will change eventually to an ash wood with hazel. Or rather it would have done so, if the ash dieback disease had not reached the Oxford area within the last year. This Chalara die-back is now seen on site and is likely to eventually cause a big reduction in ash here.

The future for this woodland will inevitably see a substantial loss of mature trees. Planting new young oak trees and small-leaved lime trees in new glades would preserve the nature of the woodland and maybe continue the production of deep, persistent, moist leaf-litter layers favoured by the rare Rolph's door snail, which is found in this cool woodland floor.

Four years ago, some young small-leaved lime *Tilia cordata* were planted in two groups as a replacement for some fallen oak trees, as this species has very beneficial flowers for insects.
The flowers produce abundant nectar from June to July, which will provide food for insects from all habitats in the valley, especially fen species. Lime was the historic native tree of the ancient woodlands of the area on limestone, as confirmed by pollen analysis results from peat deposits at Wytham Marley Fen, only a short distance to the north of Chilswell Valley.

D. Rejuvenation of blackthorn scrub to favour the breeding of the rare brown hairstreak and black hairstreak butterflies.

Surveys by experts from Butterfly Conservation in the last three years have confirmed these species are breeding on site. A rotation of blackthorn coppicing needs to be set up to keep the blackthorn patches in favourable condition for the breeding of these butterflies into the future.

BBOWT WILD OXFORD PROJECT RESULTS FOR THE FOURTH AND FIFTH YEARS, 2018–2019

Time and volunteer input to the project

Volunteers under the leadership of Andy Gunn contributed to remedial work on the fen, the limestone grassland and the copse woodland. An average of 7 days' work (at 5 hours a day) per full year is the norm and, as at other sites, the occasional summer evening (6-8pm) work session has been introduced in the week, enabling people to volunteer after the normal working day when there are long daylight hours.

Monitoring and species recording

Monitoring of habitat restoration progress happened either during the sessions or on separate visits after work sessions. General species recording in the whole valley continues to slowly add species to the known lists (see Appendix 1) and I am grateful for the contribution of observations by volunteers and valley visitors.

Volunteers have contributed important records such as a great crested newt in 2017, and records of common shrew, water shrew and grass snake in 2018. I regularly see roe deer in the valley, as do others. Butterflies are regularly recorded by experts from Butterfly Conservation. Most of my recording effort in the last two years has focused on the fen restoration areas (discussed below).

Details of work carried out on specific areas:

A. Alkaline fen area

A fen area on a valley slope facing south-east (hanging fen) was the target of remedial work. Due to a lack of cutting or grazing for many years, at the start of the Wild Oxford Project work in 2014 this area was almost a monoculture of dense, tall, impenetrable, common reed *Phragmites australis* with few other plant species. The first year of work saw the installation of a new, recycled-plastic, raised boardwalk to replace the old sleeper boardwalk, and the scything of the reeds over half the area for the first time.

Since then the regular scything and raking of reed has continued in the initially-cleared area of approximately 0.44 ha, which is just over half the originally reed-dominated area. Reed re-growth after repeated cutting and raking becomes shorter and softer, so progress was much easier. This cutting mimics the grazing the site used to have.

The more frequently the reed re-growth can be cut every year, the faster the restoration to short turf fen will be. In 2018-2019 the scything and raking sessions were timed well and thus were effective in producing a short sward by November, when plants stop growing for the winter.

Volunteers scything Chilswell fen restoration area on 15.09.2018

The annual cutting-back is most effective in reducing reed when there is a cut in the last week in June or the first two weeks of July – crucial times, as this is when the reed is growing very strongly and building up reserves. Cutting, then, works by preventing the reed carrying out sufficient photosynthesis to build up a big starch store in the underground rhizomes. Without the energy from this food store, subsequent re-sprouted reed shoots cannot grow as tall. This benefits other smaller plant species, giving them the chance of surviving to flowering without too much reed competition (mostly from shading). Light grazing would achieve the same.

Chilswell fen restoration area – a good example of how such a fen site should look by late autumn – cut short and all material raked off

A complete cut of all re-growth is necessary by September-October to remove all dying growth and thatch, so that a short sward persists over winter; high light conditions at this time at the peat surface can stimulate germination of seed. Removing all arisings twice a year removes nutrients (most importantly nitrogen and phosphorus) contained in the plant material, thus lowering soil nutrients and going some way towards combatting nutrient enrichment from the adjacent arable field up slope, and deposition of nitrogen oxides from the air pollution produced from traffic in Oxford and the ring road nearby. Cut material has regularly been piled at the bottom of the slope next to the brook. This material is available for use in the re-wetting programme, planned for summer-autumn 2019

Fen restoration results by 2019

Of course, achievement of greater species diversity of desirable fen plants is taking time, but this is to be expected. Annuals appear from seed and flower within one year, but any perennial species need to germinate and then spend one to two years growing and building up enough reserves to be able to flower and be easily recognisable.

However, reed abundance and average height has markedly declined – reed shoots are now less than a quarter of the previous, over-head, height and are sparse, with other young plants now forming a dense covering on the peat between the reed shoots. By 2019, the most noticeable plants in a general view from the boardwalk are a sea of tall marsh thistles with purple flower-heads, which have proved very attractive to a whole range of insects from butterflies to bees, flies and beetles.

Fen vegetation in July 2019 – a profusion of marsh thistles with an understorey of marsh lousewort and very little reed

After the first work in 2015 a lot of typical 'first response' annual plant species were noted in the cut-over fen area. These varied from common ruderal weeds, such as cleavers, annual meadow grass, field forget-me-not and chickweed (seed probably blown in from an arable field nearby), through to common wetland annuals, such as wavy bittercress *Cardamine flexuosa*, and rarer wetland species like the tiny bristle club-rush *Isolepis setacea,* the last two from long-lived seed banks.

In 2019 the cut-over fen area still has a flush of plants arising from wind-blown seed from the arable margin nearby, such as bristly ox-tongue *Helminthotheca (Picris) echioides* and rough hawkbit *Crepis biennis*. Now, however, more desirable wetland species, such as common fleabane *Pulicaria dysenterica* are increasing, along with the marsh thistles, and excluding those earlier ruderal species.

Large numbers of marsh thistle *Cirsium palustre* (a biennial) have ensured abundant nectar-and-pollen-rich flowers in summer 2018 and 2019. Water figwort *Scrophularia auriculata* is now recorded in substantial numbers, as it is a species with long-lived seed and so returns readily from the seed bank with disturbance of the wet peat; (volunteers walking over the site whilst cutting and raking achieve this in a way similar to poaching of the land by the feet of stock).

With continued scything management, the ruderal weeds and non-wetland species will decline, as the true wetland species become established and are spread by seed or vegetatively over the slope. Particularly impressive is the continued recurrence and subsequent spread of mats of brooklime *Veronica beccabunga.*

Detailed vegetation recording in fen restoration areas

Whilst a qualitative survey from site walkovers is useful, in 2017 it was thought prudent to set up a more detailed monitoring system for herbaceous vegetation within the cut-over fen area, with repeated recording, in order to more accurately chart restoration progress over future years.

Two 20m x 20m square sections of the cut-over sloping fen below the boardwalk were marked out and vegetation composition within each square was assessed by recording the presence or absence of species in 40 randomly-placed 28cm quadrats (actually circular wire frames). These two 20m x 20m squares can be re-located fairly accurately in the future for re-recording using the same method.

This is a method that has been used successfully to chart vegetation change in the Parsonage Moor section of Cothill fen SSSI (Snowdon, 2017). The two squares are contiguous; see sketch map below (**Figure 2**). Both squares were recorded on 31st July 2018.

To speed restoration, the west square underwent enhancement in 2017 by the spreading of October-harvested hay from Lye Valley SSSI fen in Oxford (a similar type of calcareous fen) and also by the addition of hand-collected seed of specific species from Lye Valley fen, where the donor species are now frequent. The east square has had no such hay or seed enhancement and thus acts as a control to see how species diversity changes with no addition of hay or seed, but merely as a result of the cutting and raking management.

This action was taken because experience, and consultation of literature, have shown that there are some fen plant species that will not be restored to a wetland site that has lost them simply by instituting a regime of cutting and raking or grazing. These are species with very short-lived seed; therefore there will be no store of dormant seed left in the peat to germinate following vegetation reduction and peat disturbance (because it could be up to 100 years since these plants last grew and seeded on site under the previous light, extensive, grazing, and any seed in the peat will be dead).

A good example of such a desirable fen plant with very short-lived seed is devil's bit scabious *Succisa pratensis*.

There is documentary evidence that this used to be present somewhere in the valley up to 1983 (TVERC data lists), but by 2014, at the start of this project, it was not found. The presumption is that it might have been in the fen areas, but it could equally have been in a damp grassland area.

Devil's bit scabious – taken in the Lye Valley

Conditions may now have changed in the fen to a suitable, shorter, wet turf with the restoration management but, for these species, the only way to get them back on site is by re-introduction.

The western square received specifically hand collected seed of: marsh lousewort *Pedicularis palustris,* greater bird's foot trefoil *Lotus pedunulatus*, wild angelica *Angelica sylvestris*, tufted vetch *Vicia cracca*, purple loosestrife *Lythrum salicaria*, , parsley water dropwort *Oenanthe lachenalii*, blunt-flowered rush *Juncus subnodulosus* and devil's-bit scabious *Succisa pratensis.* It may take more than one year for these species to germinate and grow large enough to be recognised and appear in the survey results.

Figure 2: *Position of the two 20m x 20m sq. sections used for recording vegetation*

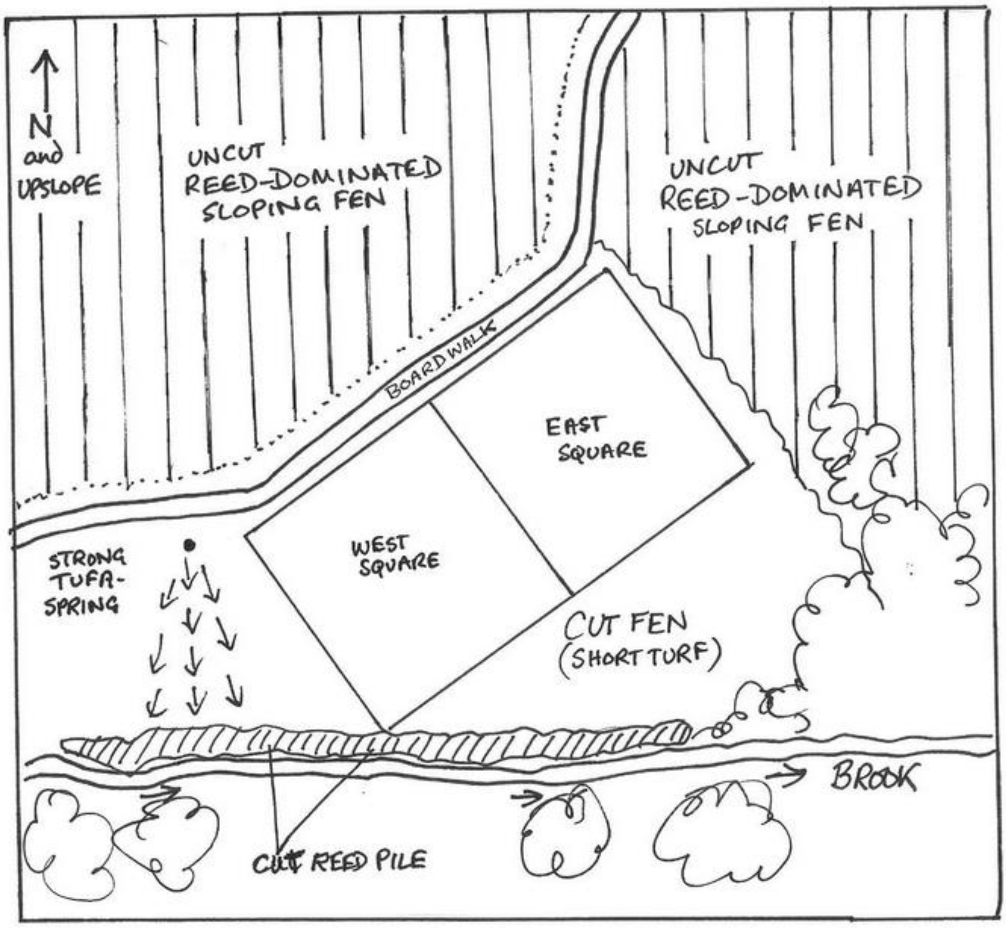


Table 1 on pages 13 to 14 shows the overall frequency of each plant species present in these monitored 20x20m squares

Results

The 20m x 20m squares were re-recorded in 2018 and the results of the two years (2017 and 2018) compared.

The total plant species diversity within just these two fen squares (i.e. in 800 m2) was 47 species in 2017 and this has increased to 68 species by 2018 with the regular cutting and raking management plus the hay spreading and seeding. The total diversity in the whole area cut and raked will be higher than this, as there are more new species outside the squares. Whilst some of these might be regarded as 'weed' species, that get everywhere in recent years (such as prickly ox-tongue and rough hawk's-beard) there are also positive gains of desirable fen species.

It should be remembered that the whole of the cut-over area fen previously, before the Wild Oxford project started work, had become almost a reed monoculture - **only three big plant species were visible** – common reed, hemp agrimony and greater bindweed.

Whilst celebrating the great increase in plant species diversity with all the work in this particular section, it must be remembered that plant diversity is sometimes not related to total diversity of wildlife. There are, of course some reed-specific animal species of invertebrate and bird that are favoured by the previous dense, tall, mainly reed habitat. A considerable part of the whole wetland area remains untouched and reed- dominated for the benefit of such species.

In the cut and raked area, reed still remains, but weak and short in stature. It no longer dominates and there is plenty of light and air reaching the peat. There has been both return of plant species from the seed bank and the arrival of new species via wind- blown seed or possibly some have arrived stuck to the coats of animals like deer or in mud on the feet of animals or trampling volunteers.

Reed is a wind-pollinated grass, producing no nectar and its previous dominance meant very little nectar was available for insects in the area (only a bit from the hemp agrimony and the bindweed) Many of the 68 species which now occupy these monitored squares are good nectar sources and the whole area is now full of insects seeking this resource from the flowers in the summer months.

New species recorded in the squares in 2018

Wild carrot, tufted hair grass, bugle, fool's water cress, Michaelmas daisy, enchanter's nightshade, spear thistle, creeping thistle, hogweed, marsh horsetail, meadowsweet, water mint, marsh lousewort (introduced) raspberry, broad leaved dock, hedge woundwort, common valerian, coltsfoot, common spear moss.

The non-flowering sedge that could not be identified in 2017 has now flowered and turns out to be distant sedge *Carex distans*, a species on the Oxfordshire Rare Plants Register[2]. This is certainly a valuable fen species well known for returning from a long-lived seed bank in the peat, so good to have it back.

Distant sedge Carex distans on 13.04.2019 A grass-like plant with brown flowers but an important and valuable fen species, returning from the seed bank, identifiable by flowers later in summer

Willow seedlings have newly colonised the squares, not a good situation. This is due to the nearness to female willows in the unmanaged portions of the fen. These female trees shed wind dispersed seed in early summer and germination is favoured by open bare peat conditions which are produced by the fen management. Some degree of willow pulling has already happened, but a good deal more is necessary to prevent establishment of a low sward of willow scrub. Getting rid of the source of seed, i.e. the female willows nearby, is a solution

Species that have increased in frequency

Brooklime, water figwort, rough hawk's-beard, blunt-flowered rush, jointed rush, marsh thistle, wild angelica, great bindweed, great horsetail, Yorkshire fog grass, purple loosestrife, hoary ragwort, comfrey, field horsetail. Square-stalked St John's wort has shown a big increase (back from a long lived seed bank) especially in the eastern square.

Species that have decreased in frequency

Bramble, rough meadow grass, rough stalked feather moss, old man's beard. Generally good to see these going down as they are not fen species.

[2] Published as Erskine S E, Killick J, Lambrick C and Lee E M (2018), *Oxfordshire's Threatened Plants,* Pisces Publications

Table 1: Plant species recorded in the 20m x 20m squares

KEY: **FP** = flowering plant			West SQ 1	W SQ 1 hay plus seed	East SQ2	East SQ2 no hay
Plant species in 20 x20 squares			**2017**	**2018**	**2017**	**2018**
Scientific name	**Common name**	**Group**	**% Freq**	**% Freq**	**% FREQ**	**% Freq**
Agrostis stolonifera	creeping bent	FP	5	12.5	5	5
Ajuga reptans	bugle	FP				2.5
Angelica sylvestris	wild angelica	FP	5	27.5	20	17.5
Apium nodiflorum	fool's watercress	FP		2.5		
Aster sp.	Michaelmas daisy	FP		5		2.5
Brachypodium sylvaticum	wood false brome	FP		2.5		2.5
Brachythecium rutabulum	rough-stalked feather moss	moss	5	15	67.5	27.5
Bryum sp	a moss	moss	15	12.5	5	
Calliergonella cuspidata	common spear moss	moss				2.5
Calystegia silvatica	great bindweed	FP	25	27.5		37.5
Cardamine flexuosa	wavy bittercress	FP			30	
Carex distans	distant sedge	FP			5	2.5
Circaea lutetiana	enchanter's nightshade	FP		2.5		7.5
Cirsium arvense	creeping thistle	FP		5		5
Cirsium palustre	marsh thistle	FP	15	20	12.5	17.5
Cirsium vulgare	spear thistle	FP		2.5		
Clematis vitalba	old man’s beard	FP			17.5	10
Cratoneuron filicinum	fern-leaved hook-moss	moss			7.5	5
Crepis biennis	rough hawk's-beard	FP		12.5	5	12.5
Crepis capillaris	smooth hawk's-beard	FP			2.5	5
Daucus carota	wild carrot	FP		7.5		2.5
Deschampsia cespitosa	tufted hair grass	FP		2.5		2.5
Epilobium parviflorum	hoary willow herb	FP	47.5	10		22.5
Epilobium sp	willow herbs	FP			62.5	10
Equisetum arvense	field horsetail	horsetail	45	50	10	27.5
Equisetum palustre	marsh horsetail	horsetail				2.5
Equisetum telmateia	giant horsetail	horsetail	5	10	17.5	45
Eupatorium cannabinum	hemp agrimony	FP	72.5	37.5	2.5	52.5
Festuca gigantea	giant fescue	FP	2.5	2.5		
Filipendula ulmaria	meadowsweet	FP		7.5		5
Fraxinus seedling	ash	FP	5	7.5		7.5
Geranium robertianum	herb Robert	FP	5	2.5		
Geum urbanum	wood avens	FP	2.5			5
Heracleum sphondylium	hogweed	FP		5		2.5
Holcus lanatus	yorkshire fog	FP		10	2.5	12.5
Hypericum tetrapterum	square-stalked St John's wort	FP	2.5	5	2.5	22.5
Juncus articulatus	jointed rush	FP	2.5	10	5	5
Juncus subnodulosus	blunt-flowered rush	FP		5	2.5	2.5
Leontodon sp	a hawkbit	FP	2.5			
Lythrum salicaria	purple loosestrife	FP	32.5	62.5	7.5	10
Mentha aquatica	water mint	FP		7.5		5
Myosotis sp	a forget-me-not	FP			2.5	
Pedicularis palustris	marsh lousewort	FP		25		2.5
Pellia endiviifolia	liverwort	liverwort	2.5	12.5	17.5	7.5
Phragmites australis	common reed	FP	100	100	100	97.5
Picris echioides	bristly ox tongue	FP		2.5	2.5	5
Plantago major	greater plantain	FP	2.5	10	5	10
Poa sp. poss triv	grass	FP	47.5	35	67.5	15
Pulicaria dysenterica	fleabane	FP	10	25	7.5	42.5
Ranunculus repens	creeping buttercup	FP	5		5	7.5
Rubus fruticosus	bramble	FP			2.5	
Rubus idaeus	raspberry	FP				7.5
Rumex obtusifolius	broad-leaved dock	FP		2.5		
Salix sp seedling	willow seedling	FP		10		32.5
Scrophularia auriculata	water figwort	FP	10	37.5	35	50
Senecio erucifolius	hoary ragwort	FP	5	17.5	2.5	15
Senecio jacobaea	common ragwort	FP		2.5		
Silene dioica	red campion	FP			2.5	

KEY: **FP** = flowering plant			West SQ 1	W SQ 1 hay plus seed	East SQ2	East SQ2 no hay
Plant species in 20 x20 squares			**2017**	**2018**	**2017**	**2018**
Scientific name	**Common name**	**Group**	**% Freq**	**% Freq**	**% FREQ**	**% Freq**
Solanum dulcamara	bittersweet	FP			2.5	2.5
Sonchus asper	prickly sow-thistle	FP		2.5	2.5	5
Sonchus oleraceus	common sow-thistle	FP	12.5	5	25	5
Stachys sylvatica	hedge woundwort	FP		2.5		
Symphytum officinale	comfrey	FP	10	17.5	2.5	5
Taraxacum sp.	dandelion	FP	2.5	7.5	15	12.5
Tussilago farfara	coltsfoot	FP		2.5		5
Urtica dioica	common nettle	FP	2.5			
Valeriana officinalis	common valerian	FP		2.5		
Veronica beccabunga	brooklime	FP			5	20

Outside the monitored squares in the drier edge of the fen, one bee orchid *Ophrys apifera* had been seen in June 2018. This year, in the same area, an increase in bee orchids, detected as leaf rosettes, was noted in winter 2018/19. Of these 16 were seen in flower in June 2019, all at the south-western end of the regularly cut-over area, next to the BBOWT sign.

They will not be the offspring of the original plant found last year. Bee orchid seed is tiny, like dust, and disperses on the wind in July. The seed must have originally reached the fen just before the very first fen-scything session with Wild Oxford in autumn 2014, as orchids such as this have a minimum life-cycle of four to five years from seed arrival to flowering.

After germination, which needs a specific symbiotic fungus, the orchid tubers grow underground with the fungus. Here, light and air getting to the peat following germination because of repeated cutting and raking would have speeded the growth of young orchid leaves and tubers, resulting in the final production of flowering spikes in 2019. Bee orchids usually die after flowering and shedding seed.

New plants may occur anywhere from now on but any offspring of these 16 plants would be unlikely to be visible until 2024!

Bee orchid leaf rosette in the fen   Jan 2019

Bee orchid flowering inamongst marsh thistles in the fen by the boardwalk 04.06.2019

Other welcome newly-returning species outside the squares include the delicate white-flowered fen bedstraw *Galium uliginosum*, which personal experience has shown returns from a long-lived seed bank in peat. The first small rosettes of devil's bit scabious have appeared from scattered seed. Parsley water dropwort *Oenanthe lachenalii*, an excellent nectar source and introduced by seed from Lye Valley in 2017, flowered for the first time in summer 2019. This is another County Rare Plants Register species.

The first white flowers of parsley water dropwort in the fen restoration area 11.07.2019

The first rosettes of devil's bit scabious Succisa pratensis in the fen 20.10.2018

In 2019 just a few patches of bog pimpernel *Anagallis tenella* were noted for the first time in the restored fen. This tiny, very low-growing, perennial, which is on the Rare Plants Register, 'runs' sideways in the manner of a strawberry, rooting from the creeping stems as it goes. Did it come back from the seed bank or did it come in with the dead remains of the marsh lousewort plants from the Lye Valley? Either way it is a desirable species to have back.

The runners with tiny round leaves of bog pimpernel were noted in the fen in June 2019

It is good to see that small amounts of blunt-flowered rush *Juncus subnodulosus* finally have recurred in the restored fen. This is one of the important target species of the calcareous short-turf fen community and either returned from the seed bank or was transferred here with the hay spread from the Lye Valley.

The importance, and results, of marsh lousewort introduction

The most important seed added to the west square was that of marsh lousewort *Pedicularis palustris*, a hemiparasitic plant, which has roots that attach to specific host plants nearby, reducing their vigour. In this way it can act as a useful 'ecosystem engineer' (Decleer et al, 2013) in hastening the reduction of previously dominant monocotyledon plants, such as reed, sedge and rush. The introduction of this plant allows biodiversity of non-parasitised plants to increase due to the reduced competition effected by the marsh lousewort.

Marsh lousewort is a biennial; therefore, when it dies it leaves a patch of bare peat, which is ideal for seed germination and seedling survival of other small plants with little competitive ability. An additional benefit is that marsh lousewort flowers are much enjoyed as a nectar and pollen source by bumble bees of all types – indeed, it is dependent on them for pollination and seed set. The introduction of marsh lousewort may in future reduce the need for a minimum of two volunteer cutting and raking sessions annually.

Marsh lousewort, Pedicularis palustris, photos taken in the Lye Valley fen, note bumble bee feeding

Whilst marsh lousewort's parasitism of rush and lesser pond sedge has been known since it was first observed by Druce (1897), it was student Will Millard of Oxford Brookes University, working for his undergraduate project on marsh lousewort in the Lye valley, Oxford, who actually found a connection (haustorium) between a marsh lousewort plant and the rhizome of reed growing adjacent to it (Millard, 2017).

During 2018 marsh lousewort plants at Chilswell were mostly small and non-flowering in the area of seeding in 2017, but already there was a notable reduction in the height of reed in their area of growth, showing they were parasitizing it.

By 2019, when the plants were in full flower the reduction in the adjacent reed was so great that, from a distance, none could be seen in the marsh lousewort-dominated zone.

Young marsh louseworts growing in their second year and reducing growth of reed around them, note reed taller in distance, where the marsh louseworts are absent 04.06.2019

Until grazing can be initiated, marsh lousewort is successfully reducing the burden of reed-cutting for volunteers in the fen restoration area.

The results of this experimental introduction show us that it would be good to introduce seed of marsh lousewort at a very early stage of fen restoration in any site dominated by reed, sedge or rush. This should occur any time after the very first reed-cut when marsh lousewort seed is available, i.e. August to midwinter. It is not yet known if marsh lousewort seed needs a cold treatment / ?exposure to a low temperature (stratification) in order to stimulate germination. If it does not, seeding with properly-stored marsh lousewort seed immediately after any reed/rush/sedge cutting and raking could probably be successful right from August through to the next February.

Remarkably, even the small first-year marsh lousewort plants seem able to cause a marked height reduction in adjacent reed, although the really big effect on reed is seen in the second year, when the marsh lousewort plants grow much taller and flower. They die, of course, after flowering, and shed seed to the ground any time from July to September. Before shedding, it is advisable to pull the dead plants up whole and move them on to another area in need of reed/sedge/rush control. In the bare area left by dead marsh louseworts, the light getting to the peat stimulates the germination of a variety of fen species. If marsh lousewort seed is all dropped in one place, it is observed that a swarm or complete 'lawn' of young lousewort plants germinates the next year. However, few of those that germinate so close together survive to the second year because of within-species parasitism between the young plants (they feed on each other). The largest plants drain the smaller ones and by the end of the second year only a few large 'winners' are visible. As most of the young plants in this crowded situation will die, to maximise the usefulness of the seed in fen restoration with minimal wastage it is best to collect the plants whole, before seed-drop, and spread the seed thinly over any area without marsh lousewort that needs tall-vegetation reduction.

Experience at other fen restoration sites has shown that the young first-year marsh lousewort plants do best if there is an early fairly-high scythe cut over their heads in late April to early May, just when the reed shoots have emerged and growing strongly upwards to about 40-50cm tall. This knocks the reed back and gives the marsh louseworts more light. But this treatment is not essential.

Can a fen have too much marsh lousewort and what if it parasitizes desirable sedge species? No doubt we will find out the answers to those questions in future years.

Fen invertebrates

In 2017, specific sweep-netting of the restored cut-over fen area revealed invertebrate diversity is increasing. A species new to the site lists is the Very Local fen snout soldierfly *Nemotelus pantherinus* in the fen restoration area. This means there are now five typical wetland soldierfly species here. A notable cranefly *(Dicranomyia lucida*) was swept in the wet woodland, which may be a future target for **conversion** to an open fen area, seeing as the ash trees here are dying.

A number (10 or more) of large soldierfly larvae in the genus Stratiomys were found in the strongly-flowing tufa spring in March 2018, indicating this is a very good breeding spot, now it has been opened up. It is most likely these larvae belong to the large banded general soldierfly *Stratiomys potamida*, previously recorded here – a smart wasp mimic insect, which is completely harmless and much enjoys the nectar of hogweed and angelica flowers.

Banded general soldierfly, Stratiomys potamida, adult male on wet mud

Stratiomys sp soldierfly larvae (segmented) and a Crenobia alpine flatworm (black) in the soft marly mud

The above were found in the fen restoration area (photo below) 24.03.2018

Water quality issues in the cut-over fen restoration area

Water-quality issues persist in this area. The strong tufa-forming spring has been tested using Freshwater Habitats Trust citizen science simple test kits and always has shown a high nitrate load of 5-10 ppm. Reed grows twice as tall and is very dark green in the area where this spring emerges, a clear sign of enrichment.

This eutrophication by high nitrate is detrimental to fen restoration to biodiverse short-turf fen. Ideally the spring water here should have less than 0.5 ppm nitrate to encourage maximal plant diversity. The source is almost certainly an arable field, regularly under wheat or rape, which occupies the high ground at the top of the valley above the fen to the north.

Except for the western end of this field (which is under conservation margin management) it is intensively cropped. It must therefore be regularly treated with chemical fertilizer and is ploughed and bare for a proportion of each year. Whilst phosphate does not move in alkaline conditions, nitrate is very soluble and will therefore have been moving from the field to the fen, either in overland water flow or infiltrating the ground and penetrating the limestone aquifer, ultimately emerging in the fen springs downslope nearby.

The ideal solution to this eutrophication from agrochemicals would be to convert this adjacent field to a no-input pasture or conservation margin flower mix, or at least create a wide non-arable buffer margin above the fen (or indeed around the whole Chilswell Valley). Eventually (possibly after several years) this would result in a lowering of nitrate input to the fen from springs, thus enabling more successful restoration of the short-turf alkaline fen. In the interim, cutting and raking-off removes nutrients annually, which is helpful.

B. Limestone grassland areas

Cows were on this area for a very short time in winter 2016-17 and the grassland vegetation was not reduced much by grazing. Since then vegetation growth throughout summers has been ranker than previously and ranker than was desirable. No grazing has happened since, so to prevent rankness and loss of diversity and provide bare soil patches for seedling establishment and basking of invertebrates, considerable volunteer effort has been put into scything and raking the slopes in the autumn, winter and early spring time slot. This has been very effective as a short-term measure to remove plant biomass to the bottom of the slope, although scything steep slopes and anthills is a challenge.

Important plant species such as the wild liquorice *Astragalus glycyphyllos* and the sainfoin *Onobrychis viciifolia* (see below) continue to be present in good populations and to flower and produce seed. Ultimately the return of grazing will be important as sustainable management.

The following photos show the work and how it has resulted in abundant flowering of a number of desirable species of importance as nectar and pollen sources for all kinds of pollinators, as well as providing a very attractive area for the casual walker to enjoy.

Spring scything and raking off the overgrowth of vegetation and bramble at the eastern end of the limestone grassland - necessary in the absence of stock grazing 24.03.2018

An excellent nectar source plant - rough chervil Chaerophyllum temulum flowering abundantly next to the path on 14.06.2018

Scythed area at the top of the south-east facing limestone grassland a sea of knapweeds and hedge bedstraw, 11.07.2019. The most popular area for butterflies and bees.

South-east facing Limestone grassland. A rich assemblage of flowers, mainly hedge- and lady's bedstraw and knapweeds on 11.07.2019, all due to restoration work. This area was dense dogwood scrub at the start of the project

Sainfoin Onobyrchis viciifolia, flowering well
at the western end of the limestone grassland

Photo Andy Gunn

North-west facing limestone grassland scrub being scythed
and raked by volunteers on 13.04.2019

North-west facing limestone grassland scrub being scythed and raked by volunteers on 13.04.2019

North-west facing limestone grassland a sea of meadowsweet flowers by 11.07.2019

C. Chilswell Copse woodland and scrub areas

Re-coppicing of old hazel stools has continued in this area at both the eastern and western ends of the copse. Coppice stools were protected from deer browsing by circular dead hedges or hazel woven fencing, which appears to have worked well, and healthy re-sprouting of the hazel stools is the rule. A small degree of path diversion, fencing and a new gate at the western end of the site was necessary to make visitor access easier and to protect areas of wood anemones from trampling by walkers. Wood anemones are particularly slow to colonise new areas and cannot cope with even light regular trampling. Patches of invasive redcurrant have been removed.

Coppicing hazel and coppice stool protection from deer browsing east end of Copse 12.01.2019

Coppicing area with woven hazel wand stool protection showing re-growth, west end of copse, 14.06.2018

In early spring 2019 scrub work extended to and area of willow and ash which had invaded fen in the bottom of the valley next to the brook. Much was removed to open a new area for fen restoration. This area had not yet been colonised by reed, so is likely to be returned to short fen more quickly than reed-dominated fen tackled in the first few years of this project. Additionally logs from this work were stockpiled next to the stream in order to be useful in future log dam construction to re-wet adjacent dry peat zones.

Volunteers removing grey willow scrub in an overgrown fen area next to the brook
Opening up the area ready for fen restoration 12.01.2019

Re-wetting fen and wet woodland areas and resilience of Chilswell Valley wetland habitats to climate change

The Wild Oxford Project at Chilswell has the aim of improving the condition of the fen wetlands which are on a depth of peat formed over thousands of years. Keeping this peat wet benefits wildlife and also is beneficial to carbon storage and sequestration (dry peat oxidises and becomes a carbon dioxide emitter). The aims of this BBOWT project are being assisted currently by a grant-funded project of the Freshwater Habitats Trust ('Saving Oxford's Wetland Wildlife'). Here money has been achieved to construct a series of log dams in the Chilswell brook adjacent to the Wild Oxford fen restoration areas. This channel has been over-deepened in the past and land drains are visible exiting in the brook banks.

The Chilswell brook has a fairly slow and gentle flow even after rain and does not suffer from flash-flooding as there is no urban development in the catchment. The log dams raise the water level in the brook and re-wet sideways by seepage and restriction of spring water draining out of the peat. The result is to re-wet the dry peat on the banks and return this area to fen suitable for the wetland fen plants that used to be present. Wetted peat will no longer be oxidising and actual new peat formation (and carbon capture from the atmosphere) can now re-start as a result of vigorously growing fen vegetation.

This work will make the restored fen areas more resilient to damaging climate change to hotter and drier conditions in summers. However, resilience to climate change can only be increased to a certain degree in the wetland areas in that water currently leaving the site can be retained to keep peat wet. Ultimately there can be no action to create more water flow from the springs upslope if rainfall reduces very greatly each summer. Spring flow-dependent invertebrates will likely be the first to suffer as they require a thin film of well oxygenated spring water in peaty areas. Re-wetting peat adjacent to the brook cannot create these specialist conditions as oxygenation may be insufficient.

Area of cleared willow next to the brook before log damming 04.06.2019

A log dam newly installed in the above area on 11.07.2019

After a week, the log dams raise water level in the brook, re-wetting adjacent previously dry fen 16.07.2019

Dryland habitats at Chilswell Valley and climate change

There is nothing that can be done to increase the chances of survival of species in the drier grassland areas in future hot and dry summers.

Short-rooted plants (such as some grasses) will die, leaving only very deep-rooted perennials able to last out a drought (greater knapweed, rockrose, restharrow). Initially this will favour annuals with a quick life cycle, which means they can flower and seed in the wetter early months of the year, then die and last-out the dry summer only as seed in the ground. Examples are yellow-wort *Blackstonia perfoliata* and perhaps centaury *Centaurium pulchellum* and the grass vetchling *Lathyrus nissolia*. There were particularly large numbers of this last plant flowering in the conservation margin to the arable field next to the Chilswell path in the hot and dry conditions of early summer 2019.

Grass vetchling Lathyrus nissolia, an annual pea-relative plant that is favoured by hotter and drier conditions and was abundant along the footpath in 2019

D. Blackthorn scrub areas and brown and black hairstreak butterflies

Blackthorn patches are frequent up and down the valley. With the sighting of both brown hairstreak and black hairstreak butterflies on site in the last few years (both breeding on blackthorn) the management of the blackthorn has to be undertaken with care. A small amount of blackthorn work has been carried out so far at the base of the northwest-facing limestone grassland. Planned work includes laying of the oldest mature trunks in other areas to encourage re-sprouting to produce younger growth especially favoured by brown hairstreaks for egg laying. This work needs careful planning and timing with advice from Butterfly Conservation and is much better done by hand rather than by large machinery, which lacks precision.

Conservation margin/headland to arable field to the north of the current Chilswell Valley LWS

The species-rich, non-cultivated, Conservation Margin at the western end of the arable field is of considerable wildlife interest to botanists and entomologists, as well as to the general public who visit it. It appears to have occasional cut-and-collect management late in the year, which is reducing scrub invasion. It already has significant populations of scarce plants, such as the wild liquorice, rockrose and hundreds of pyramidal orchids. It is full of common plants like oxeye daisy and wild carrot that are excellent nectar and pollen sources for invertebrates. All common butterflies visit but there were spectacularly good numbers of marbled whites there this last summer. Will Langdon, a visitor interested in moths, informs me that on 24th June 2019 he recorded both **the rare Section 41 (UKBAP) micromoth known as the liquorice piercer *Grapholita pallifrontana* and another notable micromoth. the orange conch *Commophila aeneana*,** in this specific area. The latter has a larva that feeds on the roots of common ragwort. The liquorice piercer is protected under Section 41 of the NERC Act for England and under Section 42 for Wales[3]. This species is historically known from Chilswell and I first found it there in 2014 (see my earlier reports for the Wild Oxford project at Chilswell). In 2018 and in 2019 I swept the wild liquorice in this area and collected numbers of a small blue green weevil that is highly likely to be *Pseudoprotapion astragali*, a weevil specific only to this plant, but this requires confirmation from an expert coleopterist. If confirmed this is an important record of a very scarce insect. I therefore recommend this is an area suitable for inclusion in the LWS.

Some of the pyramidal orchids, wild liquorice and lady's bedstraw in the conservation margin on 11.07.2019

[3] The complete Section 41 list can be found on **Wikipedia**

Flowering wild liquorice and bumblebee in the conservation margin area of adjacent arable field 14.06.2018

Tiny liquorice-specific weevil suspected to be Pseudoprotapion astragali (to be confirmed), *swept from wild liquorice here 02.06.2018*

The 'Lower Field' outside the current LWS

This area is at the lower end of the Chilswell footpath and runs along the south-eastern side of the 'Lower Field' LWS. Towards its western end and its lower areas near the brook it is on wet peat, with an abundance of greater horsetail and rushes, indicating that it is receiving seepage water-flow from higher ground to the north-west.

A walk through this area in June 2019 revealed, for the first time, at least 61 flower spikes of common spotted orchids *Dactylorhiza fuchsii* (including the large strange mutant example shown below) and three southern marsh orchids *D. praetermissa*.

In my opinion, these observations, along with a wide variety of other plants and insects found, provide justification for considering this area as suitable for an extension of the LWS to the west. This area receives only a single mechanical topping treatment once a year in the autumn by the farmer, which retards the development of willow scrub.

Lower field oxeye daisies 04.06.2019

Large mutant common spotted orchid left and a southern marsh orchid on the right from the wetter areas of the Lower Field outside the current LWS

RECOMMENDATIONS FOR FUTURE CONSERVATION MANAGEMENT AND PUBLIC ENGAGEMENT AT CHILSWELL VALLEY

- **It is imperative to secure sufficient grazing by either cows or horses in the limestone grassland areas** in future. Whilst scything and raking such steep limestone has been successfully undertaken by volunteers in the last two years to preserve diversity, it is time-consuming and takes volunteers away from management tasks that are urgent in other areas. Also, the quality of turf that results from cutting and raking once a year is never fully able to replicate the effects of grazing; there is no poaching, and anthills cannot be mown properly. **There could still be species losses of scarce-to-rare plants, and invertebrates in future.**

- **Continue hazel coppicing of mature stools in the woodlands**. The higher light levels generated will continue to stimulate flowering of ground flora, which, in turn, will favour invertebrates.

- **Tree work on dying ash and oak trees** next to the copse footpath will become increasingly necessary to preserve safe access for the public.

- **It is recommended that all crack willows near the fen restoration areas are removed** in order to reduce shading and to eliminate the source of willow seed that is causing a swarm of young willows in the fen restoration areas.

- **Further new young tree plantings.** These are required because of the fast spread of Ash Dieback (Chalara) in the area. To replace the ashes that will be felled and the currently falling oaks, further new tree plantings are recommended in appropriate dry areas (not in wet areas restorable to fen). Young trees would be best sourced from local nurseries and propagated from native stock to reduce the risk of importing young trees with tree diseases from the continent. As discussed in my previous reports, there are good reasons to continue to add young pedunculate oak and small-leaved lime as whips.

- **Continue mowing and raking the restored fen area twice a year and extend the area of scything and raking restoration to the west along the bottom of the valley next to the brook,** tackling willow scrub removal in this area. This will increase the area of priority habitat of short, diverse fen.

- As the **transfer of species-rich hay and hand-collected seed** from the Lye Valley fen to one of the monitoring squares at Chilswell is showing success, collect seed of other desirable target fen species in Lye Valley and spread them at Chilswell fen in autumn 2019.

- **Collect seed of the marsh lousewort** that has flowered well in the introduction area of Chilswell restored fen as soon as it is ready - from late summer. Either spread immediately or store this somewhere cool (fridge at $4^{o}C$) and spread on any area newly brought out of reed dominance by volunteer scything work in the winter months. Reed growth will be reduced and this will accelerate restoration to short fen.

- **Start blackthorn rejuvenation** by coppicing/laying in rotation on the various patches around the site to favour breeding of black and brown hairstreak butterflies (take advice from Butterfly Conservation specialists). Regular surveying for these species needs planning in order to assess the success of the rejuvenation.

- **The whole site will benefit from the removal of a wide buffer zone of land from intensive arable cultivation all around the valley** in order to lower nutrient input from agrochemicals to all wetland springs and to the returning fen dependent on them.

- **Extending the re-wetting started by the FHT project. Climate change mitigation, carbon sequestration and biodiversity increase will be favoured by using wood from coppicing activity to construct further coarse woody-debris dams in the Chilswell stream at regular intervals up and down the valley**. This ‘slowing the flow’ will be beneficial also in reducing flooding risk in the floodplain below. Historic deepening of the stream corridor should be reversed by shallowing the stream bed between woody dams. This will enable even greater retention of spring water on site and provide greater assistance in flood prevention around Oxford and South Hinksey.

- **Bird, bat, moth, reptile/amphibian and glow-worm surveys.** All these would be good opportunities for enjoyable and educational public engagement events and would generate useful biodiversity data. For reptiles and amphibians, refuge piles need to be constructed in appropriate positions and monitoring mats or sheets placed adjacent to them for some time before surveys, so that animals can find and use them. This is particularly important, as **a great crested newt has been discovered hibernating on site.**

- **Install some bird nest boxes on young trees.** Opportunities for hole-nesting birds to breed are currently limited in the valley and may be much reduced in the future with continuing loss of mature trees of ash and oak.

SUMMARY AND CONCLUSIONS

The BBOWT Wild Oxford Project continues to make a big difference to the habitats in Chilswell Valley in the fourth and fifth year, with all target areas showing positive change. The improvements in habitats and biodiversity have been described here, and there will be further improvements in years to come.

The last year has shown the additional positive change of The FHT funded log-damming in the Chilswell brook to achieve re-wetting of dry fen areas as part of their ‘Saving Oxford’s Wetland Wildlife’ project. This supports the Wild Oxford vegetation work of the last five years and will mitigate to some degree the damaging effects of climate change to hotter and drier conditions.

Water quality issues continue in the fen and suggestions for remediation are made.

ACHIEVEMENTS

- There has been regular repeat cutting and raking (at least twice annually) of the 0.44ha of previously reed-dominated fen. Shorter fen vegetation is now the norm in this section and there are good indications of the return of increased plant biodiversity in this area.

  Over the last five years in the restoration area total plant species diversity has increased from just 4 species to 68 species. Of this 68, some 30 are wetland species, with the remainder mostly woodland floor species or dry-land ruderals spread in from the path side and arable area nearby. The fen restoration area has come a long way from its situation at the start of the project in 2014.

First volunteer scything in the then reed-dominated fen on ***11.10.2014***

- **The work has stimulated important plant species to return** from the seed bank in the peat, e.g. fen bedstraw *Galium uliginosum*, bog pimpernel *Anagallis tenella* and distant sedge *Carex distans* – the last two are on Oxfordshire's Rare Plants Register[4].

- **Experimental spreading of hay and hand-collected seed** from the more biodiverse Lye Valley fen in Oxford has been a success. The introduction of marsh lousewort seed has shown particularly spectacular positive results in the reduction of dominating reed growth by its parasitism.

- **Nectar and pollen resources for insects in the restored fen area have increased** due to the replacement of what was mostly reed with a variety of flowers. Wetland flowers like fleabane, angelica and marsh thistle are very valuable to insects but even the ruderals and path-side species, such as hogweed and ragwort, are valuable in this context.

- **A more detailed vegetation survey method has been set up** involving permanent 20m x 20m squares. Re-recording in future should enable the gathering of valuable evidence as to the success of fen restoration on site and, in particular, the progress of restoration with and without additional seed input of species lost from the fen.

[4] Published as Erskine S E, Killick J, Lambrick C and Lee E M (2018), *Oxfordshire's Threatened Plants,* Pisces Publications

- **Re-coppicing of mature hazel and the removal of scrub of dogwood and bramble have continued** in the area of copse woodland and the margins of the limestone grassland. This is increasing the area with light, sunny, conditions and reversing valuable habitat loss due to natural succession.
- **In the absence of grazing by cows, the limestone areas have retained plant biodiversity** thanks to volunteer scything and raking in autumn-winter. These flower-rich areas are not losing species and thus are continuing to supporting many species of insects, particularly bees and butterflies. In addition, the flower display makes the walk through this area of the valley extremely attractive to all visitors.

ACKNOWLEDGEMENTS

I am grateful to Carl Whitehead of Oxford City Council for discussions and for access to documents relating to the site held in the City Council's archives and to Andy Gunn of BBOWT for discussions, as the work progressed. My thanks also go to Hayley Snowdon for discussions and for allowing access to her final MSc project report on Parsonage Moor fen. Volunteers for the Wild Oxford Project supplied occasional species records as in the Appendix 1 table. TVERC supplied historic species lists and Marilyn Cox gave invaluable editorial help with this report.

REFERENCES

Botanical Society of Britain and Ireland, A Vascular Plant Red List for England (updated 18 November 2014), Available from **https://bsbi.org/england**

Decleer, K., Bonte, D., and Van Diggelen, R. (2013), The hemiparasite *Pedicularis palustris*: 'Ecosystem engineer' for fen-meadow restoration. Journal for Nature Conservation 21, 65-71.

Druce, G.C. (1897) The Flora of Berkshire. Clarendon Press, Oxford.

Erskine S E, Killick J, Lambrick C and Lee E M (2018), *Oxfordshire's Threatened Plants,* Pisces Publications

Millard, W. (2018) An investigation into the hosts of the hemiparasite *Pedicularis palustris* (Orobanchaceae). Unpublished undergraduate project, Oxford Brookes University

Oxford City Council, Management plan for Chilswell Valley (1989), from the archive held by the Countryside Service Rangers.

Snowdon, H-L (2017) A Vegetation and Hydrological Study of Parsonage Moor, Cothill Fen, Oxfordshire. MSc presentation, Oxford Brookes University

Thames Valley Environmental Records Centre (TVERC), Flora records supplied for Chilswell Valley Local Wildlife Site

APPENDIX 1: Species found at Chilswell Valley from 2018-2019 – please see separate document