



**Legacy Plan  
for the Pond Field at  
Pengelli isaf, Llangain  
Carmarthenshire**

**Client:** Chris and Jo John

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## **1. Introduction**

Matt Sutton Ecology developed and implemented a pond proposal at Pengelli isaf on behalf of Chris and Jo John. This plan describes and illustrates the work carried out, and sets out some ideas for the ongoing management of both the ponds and the remainder of the field.

## **2. The Pond Creation Process**



The lower part of the field appeared ideally suited to a large pond. It was underlain by solid clay, and the vegetation had been agriculturally improved so of little ecological interest. The outline of the pond was suggested by the contours of the field, but a levels survey was carried out to confirm where the water would lie, and to satisfy the requirements of the planning process. A full ecological survey of the field was also carried out.





The weather was good in April, and the ground unusually dry. We set a benchmark height from the naturally-raised area under the oak trees at the back of the pond, and used a laser-level to mark out where the outline of the pond would be when full of water.

The first job then was to strip the turf off from within this marked area. The 13-ton tracked excavator scraped off the turf with its bucket, and alternately loaded 2 tracked dumpers. The dumpers moved the turf (lots of soft rush clumps) and topsoil to the upper part of the field. Soil was subsequently evened out in this area, and a power-harrow used to break up clods.







We then had to excavate a deep trench along the line of the intended bund. By doing this, we revealed the old clay drain pipes which, if left undisturbed, would have continued to allow water to drain away under the bund and into the stream. These regularly spaced drains, composed of many individual short pipes, would have been laid in hand-dug trenches. These crossed the field in a diagonal fashion. Although many were blocked with silt, they were still partially functioning. If the trenches had been back-filled with clay before the topsoil, they might have functioned for longer. A significant amount of labour would have been needed to lay them.







We marked out the positions of three deep pools or 'sumps' within the pond outline. These were then excavated in turn, with the best quality clay being piled up along the line of the bund, and the less pure material being transported to the top of the field. This was subsequently used to create a low bank around the edge of the newly raised topsoil area. The sumps were created with 'shelves' to vary the depth profile, and then connected by channels which left islands standing proud of the water in between them.







As the detail of the pond was being fashioned by Peter on the excavator, Matt was going backwards and forwards along the bund on a vibrating roller. Each new roughly spread layer of clay needed compacting and keying into the layer underneath. The water-retaining capabilities of the bund would depend on doing this thoroughly. Concern regarding the roots of the two large oak trees on the naturally raised ground led us to remove only the topsoil on this section; it later transpired that the stony nature of the subsoil coupled to the deep lateral tree root system made this more porous than anticipated.







The bund was built up to the required height, using the laser level to check for any low spots which were then filled. An outlet was fashioned on the eastern side. With little water appearing in the pond from the disrupted field drains, we needed to pull some water from the ditch on the western side of the field. This captures spring water arising at the edge of the neighbouring field – water which seems likely to have flowed out across the field before the field was created and the ditch dug. A series of stepped pools were created along this inlet channel. These would slow the water-flow, allowing plants to grow and filter out suspended particles and some of the associated nutrients or potential pollutants. The clay from these pools was used to create a low bank alongside, creating shelter for dragonflies.







With the main pond starting to fill, we turned our attention to the pond in the top corner. The clay from here was used to create a low bund, which arced along the bottom of the pond, forcing water to exit in a channel to one side. The soil from here – which looked as if an original hollow had been filled in with organic material – was spread behind this bund and graded out into the field. We even found a piece of old oak buried here, which looked like it may have been an old cleft oak fencing stake from a time before barbed wire.







The oak made a good looking kingfisher perch when stood up in the main pond! The pond filled well for a couple of weeks, then water managed to find its way into a natural soil 'pipe' near the oak trees and start draining out into the stream behind. We found and plugged this, and revisited the section of the bund where we'd been trying to avoid damaging the oak roots. We dug deep into the central part of the bund here, and ensured that a soil seal of clay replaced the subsoil and roots here. It took one or two more minor repairs with a mini-digger before the bund was sealed, and the pond was able to reach its capacity before summer was out.





### 3. Management Plan

#### Pond Management

The ponds should generally look after themselves. However, there are a few key points to consider:

*1. Don't plant anything*

The main pond will slowly mature, and the fringes will be colonised by reedmace and other tall swamp plants. This process – known as succession – is great to watch, and the different successional stages will support different wildlife. Ultimately, the pond would become a 'raft' of swamp vegetation with little or no open water. Old ponds like this can often be ecologically-richer than classic open ponds!

The introduction of pond plants shortcuts this process, and is completely unnecessary – pond plants and animals are highly adapted to find and colonise new ponds. There is also the very real possibility of introducing unwanted plants, which can be present unnoticed as tiny fragments in planting stock from aquatic nurseries. Invasive plants like Canadian pondweed and Australian swamp stonecrop, can quickly smother a pond.

*2. Occasional grazing or trampling of the pond shallows is good*

This is clearly dependent on the availability of cattle or ponies for the grassland. Grazing animals will trample the edges as they drink, and graze on emergent plants in the shallow water. By doing so, they will slow down the successional process, and maintain niches for many of the less competitive (and often rarer) plants and insects. If keeping the pond open is desired, using animals is a more natural and gentle process than periodically going in with a digger.

*3. Periodically empty the 'settlement' pools along the inlet channel*

Following on from this, keeping the ponds open by mechanical management is probably not a good, sustainable option. However, the small pools on the inlet have been designed to trap sediment and nutrients washing in from the field-edge stream. The occasional emptying of these with a mini-digger would be beneficial, with sediment best added to the shelter bank alongside.

*4. Control growth of vegetation on the bund*

Vegetation on the main bund may be quite slow to establish, but ultimately, brambles or willows could be expected to colonise. In order to maintain access, prevent shading and avoid roots possibly compromising the function of the bund, it would be desirable to prevent this. Periodic mowing may be the best way to maintain a lower growth; livestock may cause erosion of the back edge and cattle in particular would perhaps need to be fenced off with temporary fencing.





*The first plant of great reedmace (popularly known as bulrush), an early coloniser of the upper pond. Together with the floating sweet-grass behind, this would quickly grow across the shallow pool here if grazing animals aren't introduced.*





## Grassland Management

The grassland will need some careful management over a period of years if it is to be turned from a rank, dock-infested grassy sward into a wildflower-rich meadow. The key principles to follow will be nutrient depletion through cutting and grazing where possible. Introduction of seed may prove necessary, but patience will also be needed.

### 1. *Nutrient depletion through cutting.*

Past agricultural use has left a legacy of raised plant nutrient levels. Without continued fertiliser applications, nitrogen levels will fall relatively quickly. Phosphorus – the limiting element in wildflower meadows – will be held tightly within the clay soils, and will take much longer to fall. The continued removal of this element, taken up within plant tissues and animal bones, will be crucial to the success of the grassland restoration.



*Agricultural Cutting.* Cutting will be a good way of removing all plants within the sward, including the less palatable plants such as soft rush and broad-leaved dock. However, the current prevalence of these plants makes hay or haylage an unattractive proposition to local farmers. The fairly small size of the grassland, the trees in the field and the awkward access for machinery all conspire to make hay-meadow management an unlikely option. If it is to be



attractive as a longer-term option, consideration will need to be given to enlarging the access or creating a new one in the north-western field corner.

*Conservation Mowing.* Employing a contractor to cut and collect may prove to be a necessary short-term measure, but it has a few draw-backs. The cost is quite high, although as the productivity of the grassland drops, there will be less to cut and therefore less time involved. The instant removal of vegetation does not leave any time for the seed of plants to drop. Whilst most of that seed is of soft rush or docks that will be of benefit, but with desirable plants establishing in the next few years, it will be less so. Thirdly, the disposal of cut material will create localised enrichment spots within the field, which will vegetate with nettles or other nutrient-demanding plants. It will be sensible to keep to the same disposal spots each time, or, ideally look at the possibility of taking either the cut or composted material away for use elsewhere. Without a large vegetable patch or a local anaerobic digestion plant, this might be easier said than done!

*Amenity Mowing.* Using a ride-on mower would be impractical on a field-scale. It would also leave the cuttings on the ground, forming a nutrient-rich mulch and encouraging strong grass re-growth. It could be used to maintain pathways for access to the pond, and the lines of arisings from the cut-and-collect process in 2015 were an initial attempt to define a main route.

*Timing of Cuts.* A balance has to be struck between the need to take as much grass away as possible in the initial restoration phase, allowing beneficial plants to flower and seed, and keeping costs down. Having introduced seed of yellow rattle, a parasitic plant which will start to reduce the vigour of the grasses, it will be important to avoid cutting most of the field between early April and late July. Two cuts would be recommended in 2016 – one in March, and one in August. It would be important to use a low-ground pressure tractor at least in March, when the ground is likely to be wet and easily rutted. In future years, it may be acceptable to move to a single cut after late July.

## 2. Grazing.

The introduction of grazing animals would be of ecological benefit, and would help to reduce the amount of cutting necessary. It is unlikely that the field would be of interest to a cattle grazer, particularly with the movement restrictions imposed by TB regulations. A more practical option would be to borrow a couple of ponies for a short period each year. Section A Welsh Mountain ponies would be ideal, as they are light-footed, and generally used to grazing poor quality grassland. Two ponies for around two months of the year, ideally in March and then again in September, would do a lot to maintain the grassland and also check the encroachment of willow and bramble. Ponies do a good job of grazing the regrowth of soft rush in March, if it has been mown the previous year. However, if only a single grazing period is possible, autumn may be preferable as the ground will be firmer then and less prone to poaching. Ideally, while growth is strong, a late summer cut would still be taken first. Sheep are the least desirable choice, as they rarely graze rushes or other tough plants. Summer sheep-grazing is certainly best avoided.



### 3. *Introduction of Wildflower Seed*

A little over 2kg of yellow rattle seed was spread in August 2015, mostly in the drier top part on the western side of the field but also in the north-eastern corner and scattered thinly across the rest of the field. This parasite of grasses is key to the early stages of meadow restoration, and, as it was not found elsewhere on or around the field, may have struggled to colonise unaided.

In contrast to pond plants, many meadow plants are poor dispersers - they previously relied on the ubiquitous nature of meadows and the movements of hay and livestock between them. It may prove desirable to introduce locally-sourced native meadow plants in the coming years, but it would be sensible to wait until the sward is more receptive to them. Under ideal management, this might prove to be around 2020, although a limited trial could be undertaken before this. Patience is key to meadow restoration – a shift from plants like dock to yellow rattle, red clover and knapweed is achievable within a decade, but the development of a really botanically-rich meadow might take 50 years or more.



*Yellow Rattle*



## **Tree Planting**

The top part of the field, within the area delimited by the new bank, has an additional depth of topsoil, together with some of the spread cut grass. It will be fertile as a result, and would lend itself to tree planting. A 'wild orchard' would be a good theme for planting, and a variety of fruit or nut bearing shrubs introduced. These could comprise some or all of the following:

Elder, crab apple, bullace, damson, blackthorn, hawthorn, guelder rose and hazel as the main shrubs. Common dog rose, field rose, honeysuckle and bramble would be well suited to the edges.

Planting material should be sourced locally, and of local provenance where possible. The planting pattern should be randomised rather than regimented, and generous spacing of at least 2.5m retained between each sapling. Any gaps would soon be filled as individual plants spread outwards by suckering. Tree guards should not be needed. The overall planting design should allow for a network of wide (perhaps tractor width) meandering paths or 'rides' between tree groups. These could then be maintained for access by mowing. The presence of the overhead cables should also be borne in mind, and planting directly underneath these should either be avoided, or of low-growing shrubs only.

The bank surrounding this area should perhaps be allowed to vegetate naturally, rather than being planted. If the grassland within the field is to be grazed, fencing will be required on or alongside the bank. Although a relatively expensive option, a post and rail fence of cleft-oak would be more sustainable and in-keeping than standard softwood and barbed wire.



*Our own cleft post and rail fence, using oak from a woodland manager near Llandeilo*



The bottom corners of the field, behind the bund, could also be planted with native broadleaved trees, particularly those typical of damp alluvial soil such as alder. A hybrid black poplar could be sourced to replace the fine old specimen on the stream-bank. However, it may be preferable to leave these areas largely to their own devices. A tangle of brambles here will cast less shade over the pond, will provide nest sites for various small birds, nectar for bees and other insects, and potentially create the deep cover necessary for an otter natal den.

Further tree planting within the meadow area is not particularly recommended. Maturing large trees will cast a significant amount of shade, and the sward underneath these would be grassy and rather dull. Getting the meadow mown would become even more of a logistical challenge. However, if the 'parkland' look is preferred, then a widely spaced handful of pedunculate oaks would be most appropriate, and these should be kept well away from the pond edge to avoid excessive shading and leaf-drop into the water.

## **4. Wildlife**

A variety of plants, insects, birds and fungi were recorded both during the pond construction and a subsequent visit. Highlights so far have included the following selection. A full list for each group is tabulated below – extra spaces have been left to encourage further additions!

### *Birds*

Shelduck was one of the first waterfowl to find the pond – initially seen flying over during construction work, and then a visitor to the water in the first summer. If they are to breed, they'll need a rabbit hole or similar (a partly buried barrel is another option) and they'll have to march their chicks a fair way to the estuary.

A reed bunting was present around the pond area in early spring, and is one species which might appreciate the unmanaged corner and the colonising plants in the pond margin.

### *Mammals*

It didn't take long for otters to include the pond on their beat. A spraint was found on the bund in early summer, and a path worn through the grass between the pond and the south-east corner of the field was also suggestive of otters. Hopefully the trail camera will record images.

### *Dragonflies*

7 species of dragon and damselfly had already found the ponds by August 2015. These included the emperor dragonfly (pictured), and the rather less obvious scarce blue-tailed damselfly. This is a notable species, which inhabits ponds in their early, open stages then moves on as they become more vegetated.





*Emperor dragonfly found by the shelter bank alongside the inlet (above);  
Maidenhair fern in the mower shed (below)*





## Plants

A quick look in the mower shed revealed an uncommon plant – maidenhair fern – growing on the damp lime mortar between the stonework. This is more typical of calcareous sea cliffs in south Wales, and at its few known inland sites it is usually suspected to be a very closely related cultivated species.

The field held no particular plants of interest, although a single plant of corn spurrey in ground disturbed by the digger perhaps hints at arable cultivation at some point in the past. Most of the botanical interest on the land is found along the old lane on the eastern side. Here, there are a number of damp grassland plants and woodland species including moschatel, water figwort, enchanter's nightshade and brooklime, together with two obscure plants of some interest – a hybrid between hoary and great willowherb, and the less common subspecies of tormentil.

## Fungi



*Dryad's Saddle at the base of ash*

Summer was a bit early to find fungi, but a few were noticed in the old lane and streambank. The dryad's saddle, pictured on a large ash trunk, was a fine specimen, but the tastiest find was the bank full of chanterelles by the stream in the south-east corner of the field.



## List of Plants recorded

Alder	<i>Alnus glutinosa</i>
American Willowherb	<i>Epilobium ciliatum</i>
Ash	<i>Fraxinus excelsior</i>
Atlantic Ivy	<i>Hedera hibernica</i>
Betony	<i>Stachys officinalis</i>
Blackthorn	<i>Prunus spinosa</i>
Black Bryony	<i>Tamus communis</i>
Black Poplar hybrid	<i>Populus x canadensis</i>
Bracken	<i>Pteridium aquilinum</i>
Bramble	<i>Rubus fruticosus</i>
Bristle Club-rush	<i>Isolepis setacea</i>
Broad-leaved Dock	<i>Rumex obtusifolius</i>
Brooklime	<i>Veronica beccabunga</i>
Bulbous Rush	<i>Juncus bulbosus</i>
Butcher's Broom	<i>Ruscus aculeatus</i>
Chickweed	<i>Stellaria media</i>
Cock's-foot	<i>Dactylis glomerata</i>
Common Bent	<i>Agrostis capillaris</i>
Common Dog Rose	<i>Rosa canina</i>
Common Figwort	<i>Scrophularia nodosa</i>
Common Mouse-ear	<i>Cerastium fontanum</i>
Common Polypody	<i>Polypodium vulgare</i>
Common Sorrel	<i>Rumex acetosa</i>
Common Water Starwort	<i>Callitriche stagnalis</i>
Compact Rush	<i>Juncus conglomeratus</i>
Corn Spurrey	<i>Spergularia arvensis</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Creeping Cinquefoil	<i>Potentilla reptans</i>
Creeping Soft-grass	<i>Holcus mollis</i>
Crested Dog's-tail	<i>Cynosurus cristatus</i>
Cuckoo Flower	<i>Cardamine pratensis</i>
Curled Dock	<i>Rumex crispus</i>
Dandelion	<i>Taraxacum officinale</i>
Dog's Mercury	<i>Mercurialis perennis</i>
Elder	<i>Sambucus nigra</i>
Elm	<i>Ulmus sp.</i>
Enchanter's Nightshade	<i>Circaea lutetiana</i>
False Brome	<i>Brachypodium sylvaticum</i>
False Oat-grass	<i>Arrhenatherum elatius</i>
Fat Hen	<i>Chenopodium album</i>
Floating Sweet-grass	<i>Glyceria fluitans</i>
Fool's Watercress	<i>Apium nodiflorum</i>
Foxglove	<i>Digitalis purpurea</i>
Germander Speedwell	<i>Veronica chamaedrys</i>
Goosegrass	<i>Galium aparine</i>
Greater Bird's-foot Trefoil	<i>Lotus pedunculatus</i>
Great Plantain	<i>Plantago major</i>
Great Reedmace	<i>Typha latifolia</i>



Great Willowherb	<i>Epilobium hirsutum</i>
Great x Hoary Willowherb	<i>Epilobium hirsutum x parviflorum</i>
Grey Willow	<i>Salix cinerea</i>
Ground Ivy	<i>Glechoma hederacea</i>
Hard Fern	<i>Blechnum spicant</i>
Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Coryllus avellana</i>
Hedge Woundwort	<i>Stachys sylvatica</i>
Herb Robert	<i>Geranium robertianum</i>
Hogweed	<i>Heracleum sphondylium</i>
Holly	<i>Ilex aquifolium</i>
Honeysuckle	<i>Lonicera periclymneum</i>
Lesser Stitchwort	<i>Stellaria graminea</i>
Maidenhair Fern	<i>Adiantum capillus-veneris</i>
Male Fern	<i>Dryopteris filix-mas</i>
Marsh Bedstraw	<i>Galium palustre</i>
Marsh Cudweed	<i>Gnaphalium uliginosum</i>
Marsh Foxtail	<i>Alopecurus geniculatus</i>
Marsh Thistle	<i>Cirsium palustre</i>
Meadowsweet	<i>Filipendula ulmaria</i>
Meadow Buttercup	<i>Ranunculus acris</i>
Meadow Foxtail	<i>Alopecurus pratensis</i>
Moschatel	<i>Adoxa moschateliana</i>
Navelwort	<i>Umbilicus rupestris</i>
Nettle	<i>Urtica dioica</i>
Nipplewort	<i>Lapsana communis</i>
Opposite-leaved Golden Saxifrage	<i>Chrysosplenium oppositifolium</i>
Oval Sedge	<i>Carex leporina</i>
Pale Persicaria	<i>Persicaria lapathifolia</i>
Pedunculate Oak	<i>Quercus robur</i>
Perennial Rye-grass	<i>Lolium perenne</i>
Prickly Sow-thistle	<i>Sonchus asper</i>
Primrose	<i>Primula vulgais</i>
Red Campion	<i>Silene dioica</i>
Red Clover	<i>Trifolium pratense</i>
Red Fescue	<i>Festuca rubra</i>
Remote Sedge	<i>Carex remota</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Rosebay Willowherb	<i>Chamaerion angustifolium</i>
Rough Meadow Grass	<i>Poa trivialis</i>
Self-heal	<i>Prunella vulgaris</i>
Short-fruited Willowherb	<i>Epilobium obscurum</i>
Silverweed	<i>Potentilla anserina</i>
Slender St. John's-wort	<i>Hypericum pulchrum</i>
Soft Rush	<i>Juncus effusus</i>
Spear Thistle	<i>Cirsium vulgare</i>
Square Stalked St. John's-wort	<i>Hypericum tetrapetrum</i>
Sticky Mouse-ear	<i>Cerastium glomeratum</i>
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>
Sycamore	<i>Acer pseudoplatanus</i>



Three Veined Sandwort  
Thyme-leaved Speedwell  
Toad Rush  
T tormentil  
Watercress  
Water Figwort  
White Clover  
Wild Angelica  
Wood Avens  
Wood Dock  
Wood Sage  
Yellow Pimpernel  
Yorkshire-fog

*Moehringia trinervis*  
*Veronica serpyllifolia*  
*Juncus bufonius*  
*Potentilla erecta substrictissima*  
*Rorippa nasturtium-aquaticum*  
*Scrophularia auriculata*  
*Trifolium repens*  
*Angelica sylvestris*  
*Geum urbanum*  
*Rumex crispus*  
*Teucrium scorodonia*  
*Lysimachia nemorum*  
*Holcus lanatus*



## **Dragonflies Recorded**

Common Blue Damselfly  
Azure Blue Damselfly  
Scarce Blue-tailed Damselfly  
Emperor Dragonfly  
Broad-bodied Chaser  
Common Darter

*Enallagma cyathigerum*  
*Coenagrion puella*  
*Ischnura pumilio*  
*Anax imperator*  
*Libellula depressa*  
*Sympetrum striolatum*

## **Butterflies Recorded**

Ringlet  
Meadow Brown  
Holly Blue

## **Birds Recorded**

Great Spotted Woodpecker  
Nuthatch  
Mistle Thrush  
Song Thrush  
Blackbird  
House Sparrow  
Chaffinch  
Goldfinch  
Redpoll  
Pied Wagtail  
Meadow Pipit  
Robin  
Blue Tit  
Great Tit  
Swallow  
House Martin  
Sand Martin  
Reed Bunting  
Red Kite  
Buzzard  
Shelduck  
Grey Heron