Restoring wildflowers at Longrun Meadow, Taunton

Longrun Meadow is considered to be Taunton's Country Park in the middle of the County town. It provides an active part of Taunton's flood defences along the River Tone that forms the northern boundary of the park. It is an important area of amenity grassland used by of the town's residents for activities including dog walking, orienteering, walking, and is the location of a weekly Parkrun (and Junior Parkrun)
In 2014, the decision was made to improve the biodiversity of cathedral field to:

- Create a flower-rich area beneficial for pollinators and other wildlife;
- Showcase wildflowers as an amenity resource for enjoyment by the local community, and;
- Provide an opportunity for outdoor education about the natural environment.

Location

Longrun Meadow is a series of fields, flood water attenuation impounds and flood relief channel within the county town of Taunton (figure 1). Its extent is 26.4 ha.

Figure 1: Map of Longrun meadow. The edge of the country park is outlined in red.

Cathedral field lies in the centre of the site and is 4.5 ha in size (central grid reference ST21652509). The field boundary on the northern side is the River Tone and there is a footbridge entering the field. There are hard standing footpaths along the northern, eastern and southern edge. The southern boundary adjoins Longrun Lane, allowing vehicle access directly into the field through a field gate. The majority of the field is a species-poor mixture of grasses with a few wildflowers. The northwest quarter of the field has been planted with mixed broadleaved saplings and another small block of woodland is centrally located on the east side. Near the north boundary a willow cathedral, a living structure of willow saplings woven into a church structure has been constructed. This is a hub for events and education activities in the country park (figure 2).

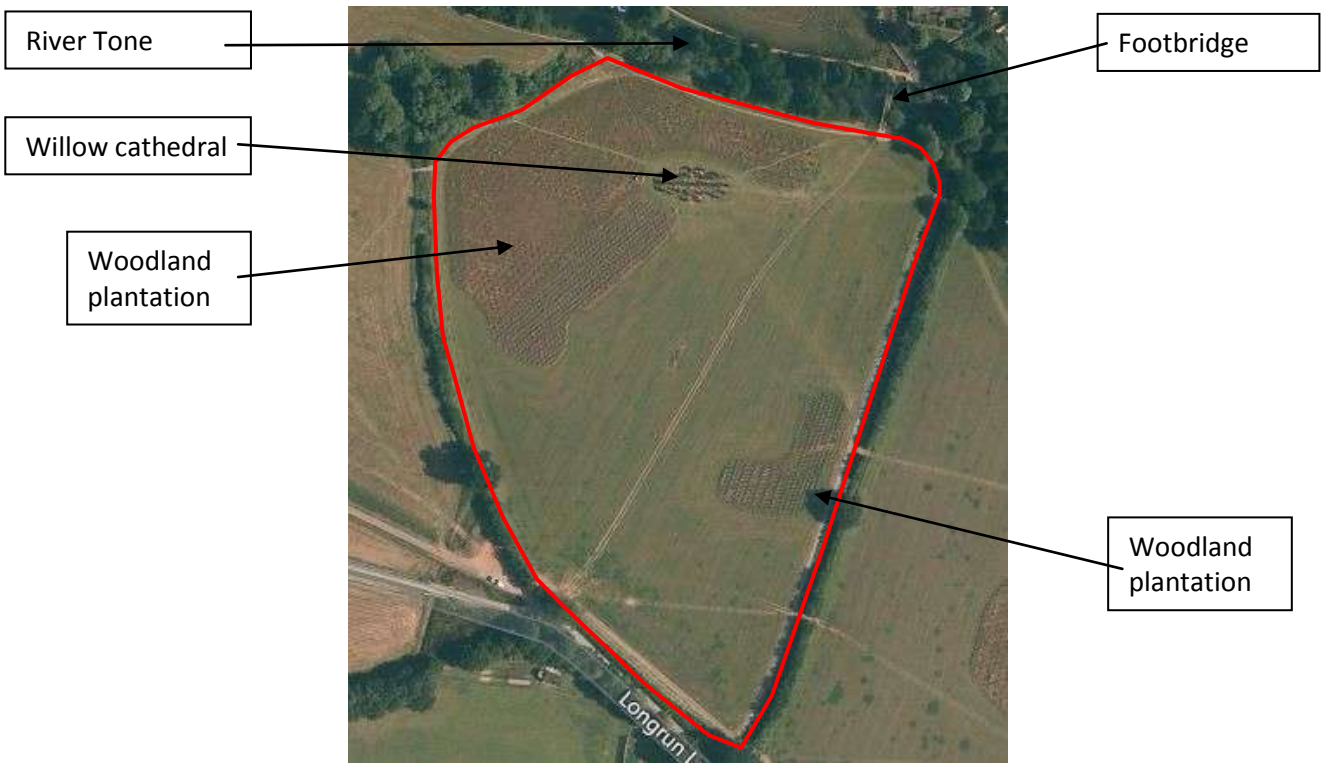

Figure 2: Cathedral Field.

Grassland covers 3 ha of Cathedral field. Funding was raised to restore wildflowers to 2 ha of the field (figure 3). This covers the majority of the grassland, excluding the southeast quarter, which has denser and more tufted vegetation with some rush, and can flood more frequently than the rest of the field resulting in standing water.

Figure 3: Area of cathedral field proposed for reseeding with wildflowers (shaded in bright green).

Environmental Measures

Longrun Meadow is under an Entry Level Stewardship (ELS) Scheme. This is a five year period of environmental measures between 2013-2018. Cathedral field was entered into the scheme under the management option EK3 Permanent pasture with very low inputs. A stipulation of this option is that the 3 ha field must be maintained as permanent pasture and not ploughed, cultivated or re-sown. Although the restoration of a wildflowers falls within the ethos of the scheme, the management work involved preparing the site and subsequent re-seeding with wildflower seed would negate this option, meaning that the terms of the ELS agreement would not met. Cathedral field is considered to be the best location for wildflower restoration due to the presence of the willow cathedral and central location within the park. As a solution, the EK3 option was moved to another field on the site. This continues the ELS agreement without a breach of the terms of the prescription, and sustains the environmental payments that the community group receive that help the environmental management of the meadows. Natural England was contacted and this decision was agreed and finalised on 24th October 2015.

As Longrun Meadow was last cultivated for arable crops in 2009-10, which is within 15 years of the wildflower sowing in 2015, an Environmental Impact assessment under the Agriculture regulations is not required to assess the impact of harrowing.

Current Management and Vegetation

Until 2009-10 Longrun Meadow was under arable land use being cultivated for cereals including maize. In 2010 the park was formed and an agricultural mixture of grasses was sown across all of the fields, flood water capture impounds and flood channel. Parts of the flood relief channel are more diverse with species present such as lady's bedstraw *Galium vernum*, and a species-rich mixture of 'green hay' was spread across a small section of a flood attenuation impound in 2013 to diversify the flora. However, this attempt was not successful in the long term with a few surviving plants of yellow rattle *Rhinanthus minor* present in 2014 and none found in 2015.

The flora composition of cathedral field is relatively species-poor and dominated by tufted grasses (table 1 and figure 4). These were sown as part of an enhanced grass mixture when the arable field was converted to grassland in 2010. It has been managed as a hay meadow for the intervening period with an annual hay cut in late July or August. No other management has been undertaken. Usually hay meadow management includes a period of aftermath livestock grazing, but the public access at Longrun Meadow prohibits this management. As a consequence, a thick layer of dead grass litter has been caught between the tufts of grasses covering the soil in a thatch. This was not ideal conditions for re-seeding, as the seed needs to touch the soil to trigger germination and seedling growth. Furthermore, some wildflowers are not tolerant of shade and would not germinate if thatch restricts light onto the soil surface. Future management should consider how to reduce thatch build-up; otherwise this will smother the wildflowers.

Yellow rattle is particularly shade intolerant, and although a hemi-parasite on grasses, requires bare ground to germinate and can struggle to establish in tufted grasslands. It is an annual plant; germinating early in the year (February to March) after a cold spell, maturing, flowering and setting seed in a single year. It is particularly important to establish yellow rattle to reduce the grass cover within a field allowing space for other wildflowers to germinate. All wildflower seed should be scattered on the soil surface rather than drilled into the soil as this is the manner that nature sheds its seeds. Yellow rattle is very viable from seed if the right germination conditions can be produced.

In a grassland with particularly tufted fast-growing grasses, such as cathedral field, a high coverage of bare ground should be created to reduce the vigour of the grasses and the seed should be spread between July (when the yellow rattle seed is harvested) to December. In addition, the potential for flooding at Longrun meadow means that the seed was spread slightly earlier to allow rainfall to push it further onto the soil.

There are problem species present in cathedral field. These may be partly related to the historical arable land use. Plants including broadleaved dock *Rumex obtusifolius*, creeping buttercup *Ranunculus repens*, creeping thistle *Cirsium arvense* and common ragwort *Senecio jacobaea* are present. All may require control in the future. The creation of bare ground may increase these species initially, and they will need to be removed to realise the value of the hay crop which is not viable with their presence. However, these plants are being managed elsewhere at Longrun meadow.

Table 1: Species list and frequency of plants present in Cathedral field surveyed in June 2015.

Common name	**Species**	**Frequency**
Perennial rye-grass	*Lolium perenne*	Abundant
Cock's-foot	*Dactylis glomerata*	Abundant
Creeping bent	*Agrostis stolonifera*	Abundant
Yorkshire fog	*Holcus lanatus*	Abundant
Soft brome	*Bromus hordeaceus*	Abundant
White clover	*Trifolium repens*	Occasional
Broadleaved dock	*Rumex obtusifolius*	Occasional
Red clover (agricultural variety)	*Trifolium pratense*	Occasional
Creeping thistle	*Cirsium arvense*	Occasional
Creeping buttercup	*Ranunculus repens*	Occasional
Common ragwort	*Senecio jacobaea*	Occasional
Goat's-beard	*Tragopogon pratensis* agg.	Occasional
Greater plantain	*Plantago lanceolata*	Occasional
Common vetch	*Vicia sativa*	Occasional
Dandelion agg.	*Taraxacum agg.*	Occasional
Wild teasel	*Dipsacus fullonum*	Rare
Black medick	*Medicago lupulina*	Rare
Common knapweed	*Centaurea nigra*	Rare
Cat's-ear	*Hypochaeris radicata*	Rare
Crested dog's-tail	*Cynosurus cristatus*	Rare
Self-heal	*Prunella vulgaris*	Rare

Figure 4: Photograph of cathedral field with the willow cathedral in the background. The line of sight is taken along the north-south footpath through the field (photo taken on 3rd June 2015)

Method

The process undertaken at Longrun meadow has been split into preparation, undertaking the restoration and future management considerations.

Site preparation

A nutrient test was undertaken to find out the phosphorous (P) levels (appendix 1). The result indicated that P was relatively high for wildflowers with an index of 2.2. An index of 0 to 2 is recommended for restoring wildflowers. Wildflowers may struggle to establish in soils with an index greater than 2, particularly if there are tufted and more competitive grasses are present. The higher P levels may be a result of the historical management as arable fields which likely had fertiliser applications, and also due to the winter flooding which leaves a layer of nutrient-rich silt across the field. The soil structure is dominated by clay and silt which holds P, and the levels are unlikely to be lowered by taking frequent grass cuts. However, a P level of 2.2 is not prohibitive, and there are some wildflowers, including yellow rattle, which can cope with higher soil nutrients.

Ragwort was pulled for the hay cut undertaken in 2015, and as a management measure to reduce the amount of seed present in the ground. This may reduce a flush of this problem species occurring in 2015-2017.

As a test of the equipment, Foxes Farm Services (Simon Fox) trialled the power harrow and roller to produce 90% bare ground (figure 5). Two depths were trialled, with the deeper setting on the power harrow being more effective at creating bare ground. The tufted grass was found to re-establish relatively quickly, and the higher setting became vegetated more quickly with grass seedlings showing within in an eight week period between the trial and undertaking the restoration works.

Figure 5: Testing the depth of the power harrow and roller. This was following a relatively dry period of weather with a single brief shower just prior to the works (photograph taken on 3rd September 2015).

Longrun meadow is a well-used park and there were concerns regarding public perception. In late September 2015 signs were places on the notice boards providing some details and explanation about the planned work (figure 6).

Figure 6: Notice about the wildflower seeding and creation of bare ground (photograph taken on 28th October 2015).

Undertaking the restoration

The wildflower restoration was planned to be undertaken over several years. The first phase, undertaken in October 2015, was to sow yellow rattle seed. Future introduction of wildflower seed following a reduction in grass coverage may also need to be undertaken to increase the species diversity of the fields.

To remove the grass thatch and create a large amount of bare ground the 2 ha field was power harrowed. The weather prior to the works undertaken on 28th October was much wetter than prior to the trial, and as a consequence, slightly less bare ground was created by the power harrow. A seed hopper on the back of the harrow dropped the seed on top of the soil, and a roller following the harrow pressed the seeds down. This was all undertaken as one single operation reducing the number of passes over the ground, thus reducing any compaction by the machinery (figure 7).

Figure 7: tractor with power harrow, seed hopper and roller (photograph taken on 28th October 2015)

There are several footpaths crossing the field that are regularly used. Two were retained; the north-south path from the footpath at the south to the footbridge across the River Tone along the northern boundary, and an east-west path crossing to the willow cathedral. This was to minimise the inconvenience to the public. During the works signs were placed at the entrance of all footpaths crossing the field to warn people about the use of heavy machinery and ask that they walk around the edge of the field. They were put up just before the works and taken down immediately afterwards to minimise any inconvenience (figure 8).

Figure 8: Signs about the temporary footpath closures whilst the machinery was being used on the field (photograph taken on 28th October 2015).

Yellow rattle seed was purchased from Goran Farm, a local seed supplier in the Blackdown Hills. A spreading rate of 0.5 g per square metre across the 2 ha equated to 10 kg of seed. Goran Farm also gave 1.24 kg of wildflower seed 'barn sweepings' as a contribution to the community group. This was combined with the yellow rattle seed in the seed hopper. The seed hopper dropped the seed in rows, and it is likely that the yellow rattle will look uniformly in lines during the first year and possible for a few further years depending on how well it spreads (figure 9). In addition 0.54 kg of common knapweed *Centaurea nigra* and 0.23 kg of oxeye daisy *Leucanthemum vulgare* were also given to the community group for sowing. As this contained seed heads, it was not possible to put this into the seed hopper, and instead it was hand spread concentrating on the northern section close to the willow cathedral and along the harrowed strips closest to the footpaths.

Yellow rattle, as an annual, will flower in the first year; however the other seed will take one of more years to flower as they are perennials. It is not known whether there are any other annual plants in the 'barn sweepings', and if there are they will appear in 2016 but not in future years as the ground will not be disturbed sufficiently to encourage germination (annual plants usually require some cultivation of the field). This may make the wildflowers look very sparse in the first year. The yellow rattle will help to open space between the grasses and reduce vigour making it easier for wildflowers to germinate and form rosettes in the first year, 2016 and begin to flower from 2017 onwards. Oxeye daisy is a short-lived perennial flower and can mature to flowering in the first year after being sown, but does need to regularly set seed into bare ground to maintain the population. Most other wildflowers take longer to develop rosettes and may flower from year two onwards. It is expected that additional wildflower seed may be required at some point in the future to increase the diversity of wildflowers present in the field.

Figure 9: Yellow rattle seed spread at a rate of 0.5 g/m^2 (photograph taken on 28th October 2015).

The works were successful at seeding 2 ha of the field at the correct rate and with a good amount of bare ground (figures 10 and 11). Also, there was a genuine interest in the works shown by the people visiting the park, especially as the date fell within autumn half-term week (figure 12).

Figure 10: Wildflower seeding adjacent to the willow cathedral (photograph taken on 24th October 2015).

Figure 11: The 2 ha field after wildflower seeding, facing the willow cathedral (photograph taken on 24th October 2015).

Figure 12: A family watching the wildflower seeding (photograph taken on 24th October 2015).

Future management

The future management needs to consider maintaining conditions to encourage the wildflowers, particularly yellow rattle. The recommended management is a hay cut in late July or August after the wildflowers, particularly common knapweed which can be later flowering than other species, have set seed. The grass should be cut, turned, tedded and dried on the field and bailed. The drying process is particularly important to release the seeds from the flower heads scattering them across the field. This will encourage germination in other areas and regenerate the soil seed bed.

In addition, the field should be chain or tine harrowed on an annual basis in early autumn to pull out and remove any grass thatch. Without this additional management it is likely that the dead leaf litter will build-up over the soil surface, adding nutrients which will encourage grass growth to the detriment of the wildflowers, and stop any seed reaching the soil surface preventing germination of new plants.

Problem plants will need to be managed. Ragwort can be managed by pulling, and thistles can be pulled or hoed (using a thistle hoe). In extreme cases herbicides may need to be used for spot treatment.

Appendix 1

NUTRIBALANCER™

Mole Valley Forage Services
[illegible]

Analysis Results (SOIL)

Customer SOMERSET WILDLIFE TRUST
UNIT 1 TONEDALE BUS CENTRE
TONEDALE
TA21 0AW
01749 871248

Distributor MOLE VALLEY FORAGE SERVICES
SOUTH CENTRAL
CLIVE BETHELL
07896 134346

Sample Ref LR MEADOW

Date Received 13/07/2011

Sample No D029331/01

Crop GRASS (CATTLE)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.5	6.5	Optimal	Adequate level but P availability may be compromised
Phosphorus (ppm)	18	26	Slightly Low	(Index 2.2)
Potassium (ppm)	78	121	Low	(Index 1.2)
Magnesium (ppm)	162	176	Slightly Low	(Index 3.5)
Calcium (ppm)	2500	2000	Normal	Consider treatment to maximise calcium and major nutrient availability
Sulphur (ppm)	2	10	Very Low	Consider treatment for optimum grass growth.
Manganese (ppm)	52.4	45.0	Normal	Adequate level.
Copper (ppm)	12.2	8.0	Normal	Adequate level.
Boron (ppm)	1.38	0.50	Normal	Adequate level.
Zinc (ppm)	10.8	7.0	Normal	Adequate level.
Molybdenum (ppm)	0.11	<0.50	Normal	No problems anticipated.
Iron (ppm)	1156	50	Normal	Adequate level.
Sodium (ppm)	29	90	Very Low	PRIORITY FOR LIVESTOCK HEALTH.
C.E.C. (meq/100g)	18.0	15.0	Normal	Cation Exchange Capacity indicates a soil with a good nutrient holding ability.

Additional Comments

The analyses and interpretation for P & K has been carried out using according to MAFF RB209. PLEASE NOTE: The recommendations can be adjusted if organic manures are used. See RB209 for more information.
The guidelines shown are for optimum livestock health. Except for P and K where guidelines and recommendations are for Grazed grass according to RB209.

Please Note

Whilst every care is taken to ensure that the Results from Analysis are as accurate as possible, it is important to note that the analysis relates to the sample received by the laboratory, and is representative only of that sample. No warranty is given by the laboratory that the Results from Analysis relates to any part of a field or growing area not covered by the sample received. It is important to ensure that any soil, leaf, silage or fruitlet sample sent for analysis is representative of the area requiring analysis and that samples are obtained in accordance with established sampling techniques. A leaflet containing instructions on how to take soil, leaf, herbage, silage and fruit samples for analysis is available from the laboratory on request.

Lancrop Laboratories