Creating bare ground for meadow restoration. Experiences of some Coronation Meadows project sites

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CORONATION MEADOWS

This note is intended only to give some brief examples to help inform decisions of local partners involved in the project on opening up bare ground prior to seeding, by highlighting specific past sites and experiences. The examples are skewed towards those for which we have a good photographic record and we would welcome good examples by other methods to give a balance for a future iteration. Thank you to all our local partners and contractors who have submitted their thoughts and pictures

In working with local organisations across the UK the Coronation Meadows project has found one of the main contrasts between counties is how they interpret standard guidance on creating bare ground and the methods they use. Chain Harrowing is favoured by some long-running meadow restoration projects such as the Yorkshire Dales Haytime project (who for reasons of archaeology have never power harrowed) while others such as Cumbria's Meadow Life project and the Weald Meadows Partnership commonly make use of power harrows where circumstances allow as have some of the Wildlife Trusts involved in Coronation Meadows.

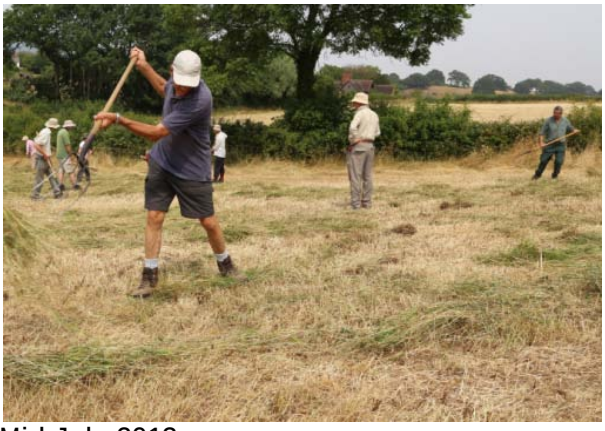
Claire Cornish (of Cumbria's Meadow Life project and now also of Coronation Meadows) suggested that the first things they consider before electing to power harrow are soil type and weed burden. If it's too gravelly they don't do it as it brings up stones and can bust the harrow, and if it's too clayey they don't either as it can make too much mess. Similarly if it has rushes/thistle/dock prevalent in the sward they wouldn't power harrow (or if there was a significant adjacent weed burden likely to blow in). Shallow stone field drains and the slope of the field are also considered.

When they do choose to power harrow they typically start with the power harrow set to an inch and see whether that opens up enough ground and if not they then set it to 2 inches. They have never gone deeper than 2 inches.

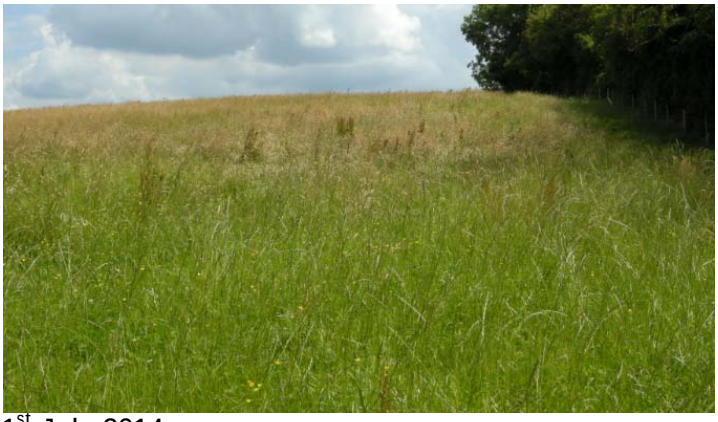
The key is to open up sufficient bare ground to allow wildflower seed to germinate and establish. Chain harrowing can sometimes be insufficient while with power harrowing there is an added risk of disturbing weed seed banks. Individual site conditions should drive the decision and sites with a high weed burden should not be considered for enhancement. Archaeological interest should be considered before harrowing and heavy clay or stony soils avoided. After power harrowing the sward will typically green up again in 4-6weeks. The sward may remain thin for up to 2 years (depending on depth and soil type), but the field doesn't stay brown for long.

Example sites.

Worcestershire – insufficient chain harrowing



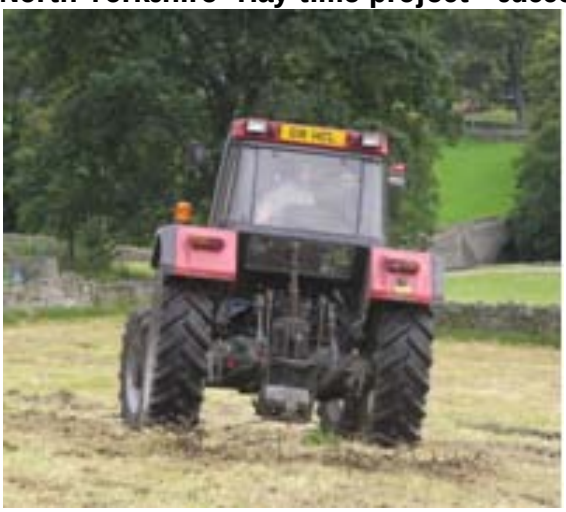
Mid July 2013



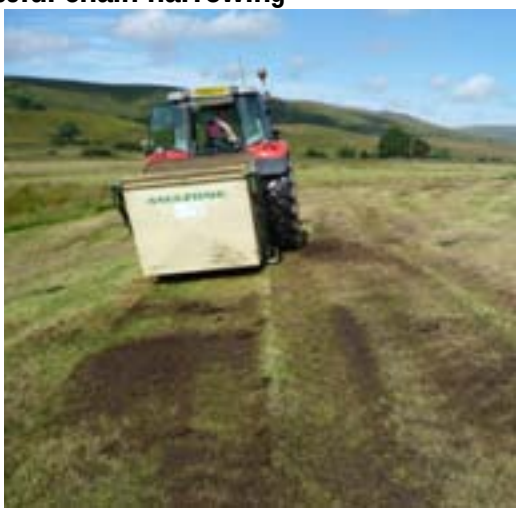
1st July 2014

This site was chain harrowed prior to spreading green hay, however it was done in a very dry spell in July 2013 and there were concerns at the time that insufficient bare ground had been created. In 2014 and 2015 there had been little sign of wildflower establishment and the decision was taken to do further restoration work in a different part of the same field (which adjoins the donor). That year they used a disc cutter to break up the soil and reported that although they got a flush of thistle they saw better germination of target species including yellow rattle and a reduced grass crop to compete. NB we would normally advise waiting 3 or 4 years before assessing whether a restoration has succeeded or not and there may have been other contributing factors involved in the lack of early establishment.

North Yorkshire -Hay time project – successful chain harrowing



Chain harrowing

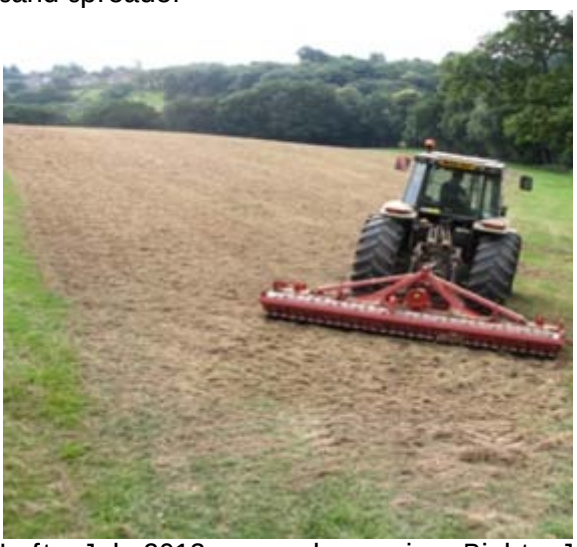
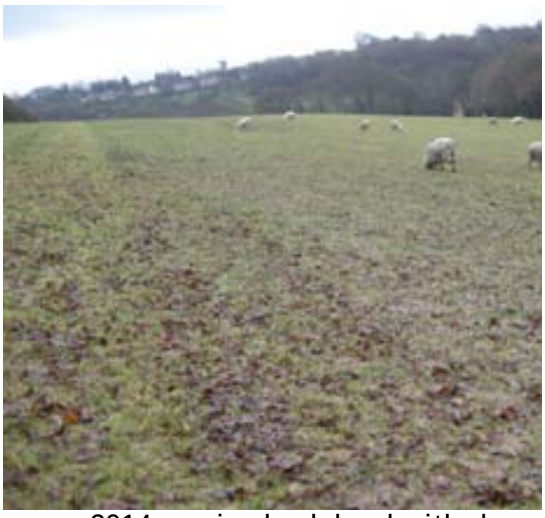


Scarifying with Amazone

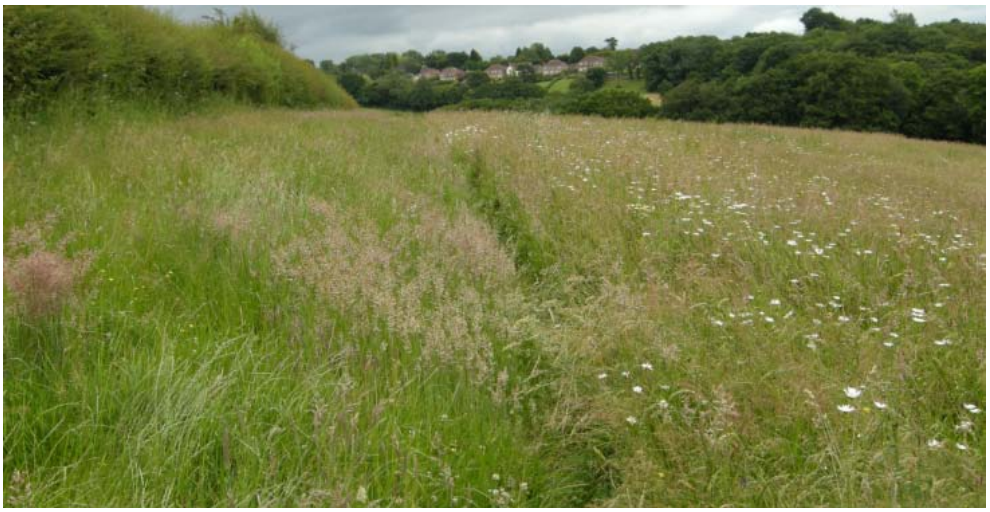
Tanya St Pierre of the Haytime project suggests they typically recommend to farmers that they do chain harrowing in strips going up and then across as well as thoroughly as possible within three days or less prior to the arranged seeding date. They have found better results where the seed has subsequently been rolled in. They occasionally have problems potentially with chain harrow availability, having to consider any archaeology and that if it is dry weather it is not very effective, however with their shallow limestone soils chain harrowing is generally considered the best option. At a site where there was an access issue for larger machinery they used an Amazone, adapting the machine (usually for seed harvesting) by turning the blades vertically and scarifying to a depth of about an inch, this proved successful however they returned to using chain harrows as the preferred method for ease.

East Sussex – Weald Meadows Partnership an extreme but successful power harrow

Dawn Brickwood of the Weald Meadows Partnership says that they typically recommend power harrowing over chain harrowing as in their experience (in Sussex/Kent & Surrey) chain harrowing often fails to create enough bare ground. She repeatedly finds site owners nervous of power harrowing (preferring to chain harrow) but suggests the risk of creating insufficient ground through chain harrowing is high leading to limited establishment of seed. She underlined that having a tight sward pre-harrowing is important as if the grass is longer the power harrow can rip it up. Again they would only power harrow to a depth of an inch or two and are driven by the individual site circumstances. At this site, overseen by estate manager and Coronation Meadows Steering Group member Keith Datchler they power harrowed then spread seed harvested using a mini-combine by spraying it out of a sand spreader

Left - July 2013 power harrowing. Right - January 2014 grazing back hard with sheep (brought on for short periods)

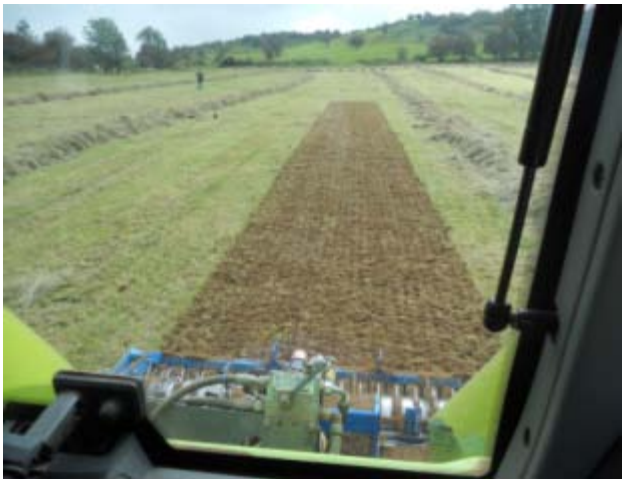


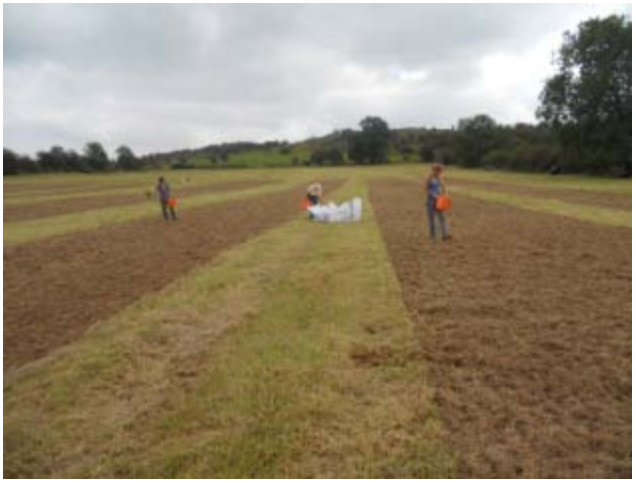
June 2014 The path in the centre of the picture separates the restored grassland to the right from an untouched control strip to the left)

June 2014 – close up on the sward in the restored area one year after restoration

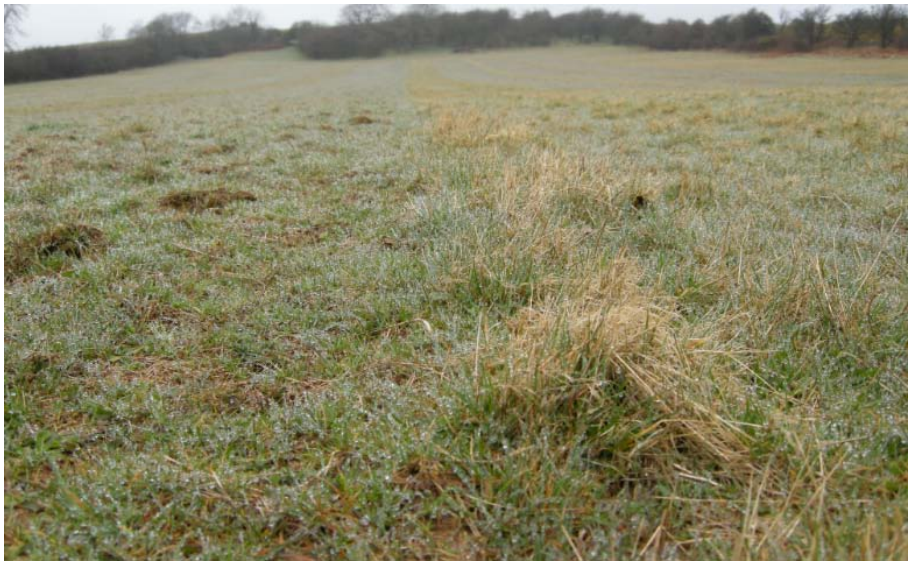
Somerset - power harrowed strips on a nature reserve site

This Nature reserve site in Somerset had to be harrowed in strips as there were still lines of cut grass lying on site when the harrow arrived. The brush harvested seed was spread by volunteers and the works overseen by Somerset Wildlife Trust.

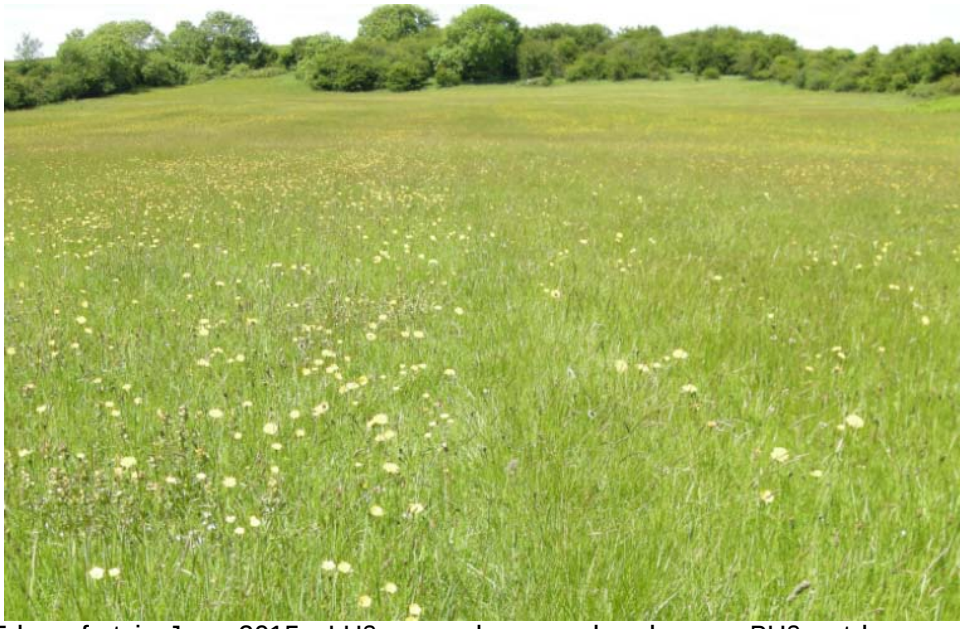




Strips power harrowed and seeded in late summer 2014 by Somerset Wildlife Trust

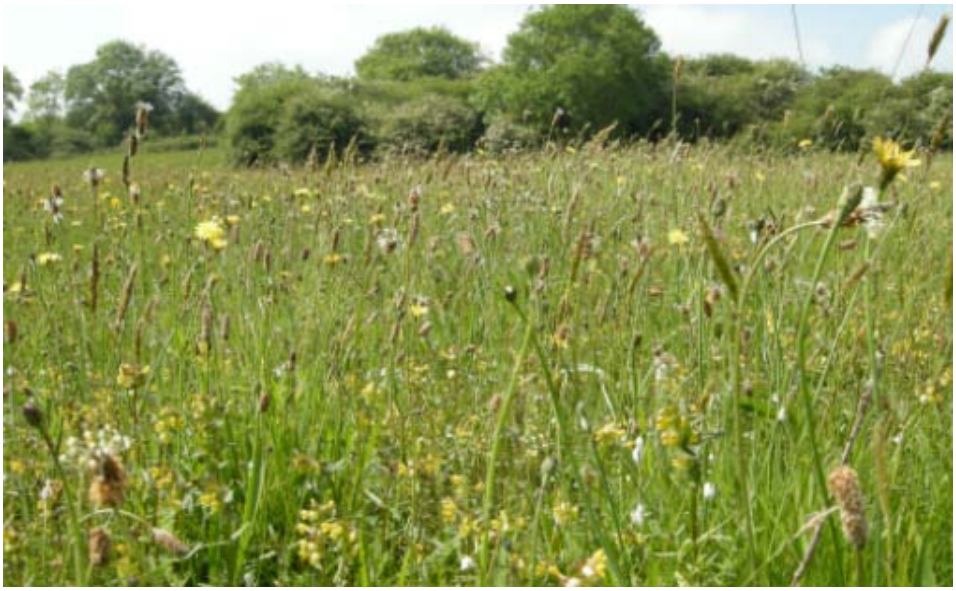


Edge of strip in April 2015 – LHS power harrowed and sown, RHS not harrowed or sown



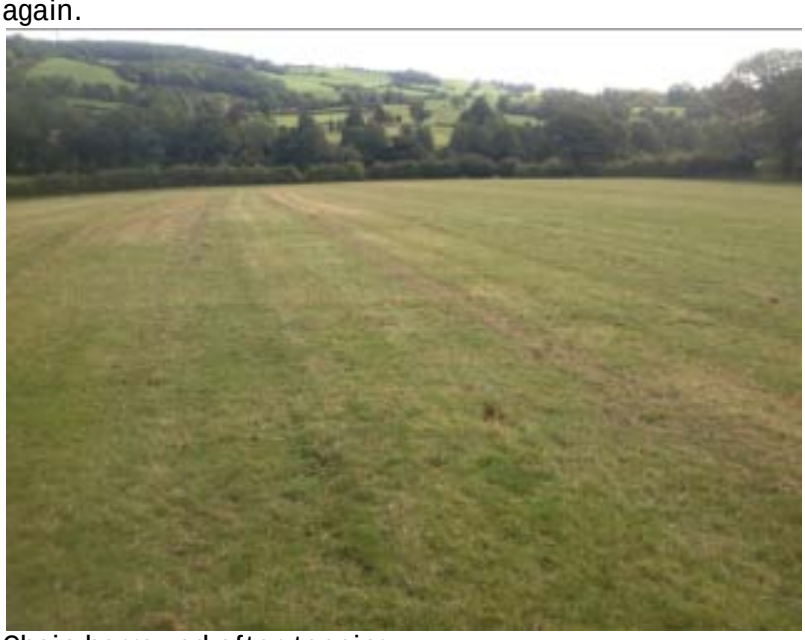
Edge of strip June 2015 – LHS power harrowed and sown, RHS not harrowed or sown

Sward in power harrowed and sown strip June 2015.

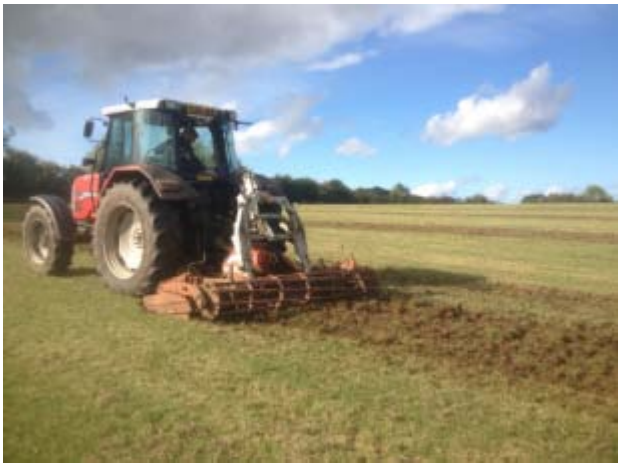

And June 2016

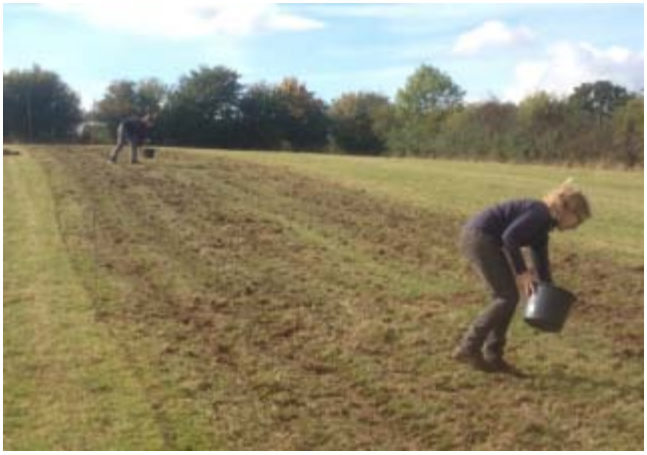
Hereford – a 2015 example of chain harrowing and then power harrowing.

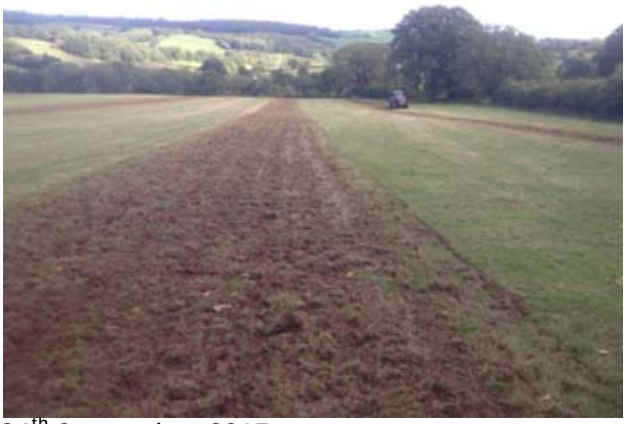
The farmer (a neighbour of the owner) at this site was uncomfortable with power harrowing and proposed that chain harrowing should open sufficient bare ground. Though tentative in his approach he was willing to revisit the site until suitable conditions were achieved. Initially there was an issue as the sward hadn't been sufficiently close cropped for chain harrowing to be likely to have any effect while power harrowing in the circumstances was likely to be problematic in ripping the long grass. The farmer tried chain harrowing it before cutting it shorter but with no effect. We advised that he top it and lightly power harrow but he was again reticent and after topping it decided to chain harrow again.


Chain harrowed after topping

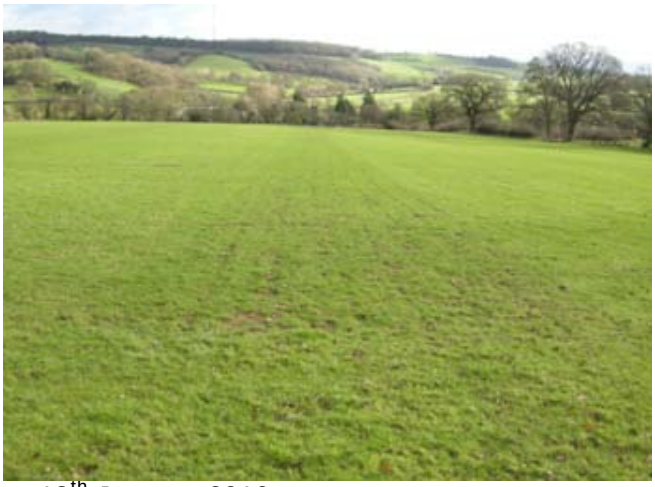
The following morning when the seed and volunteers arrived the site was as per the above pictures. The chain harrowing was deemed by the project to have not opened up sufficient bare ground to warrant the spreading of the seed. The owners recognised that the chain harrowing was insufficient but were nervous of the 2ha field being churned by power harrowing. Agreement was reached by all three parties by having the farmer power harrow strips (2 passes wide) with the harrow set to half an inch as per the pictures below. The work was done that day overseen by Plantlife allowing the seed to be spread that afternoon. It was subsequently rolled.



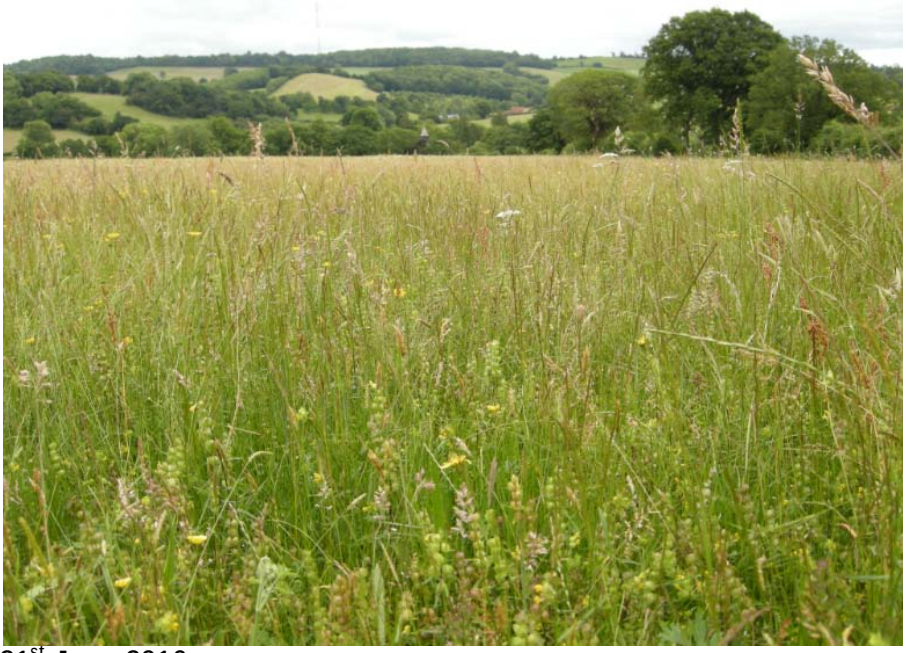




24th September 2015



13th January 2016

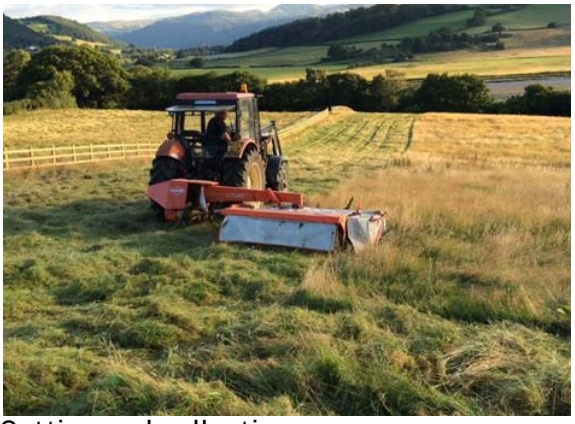
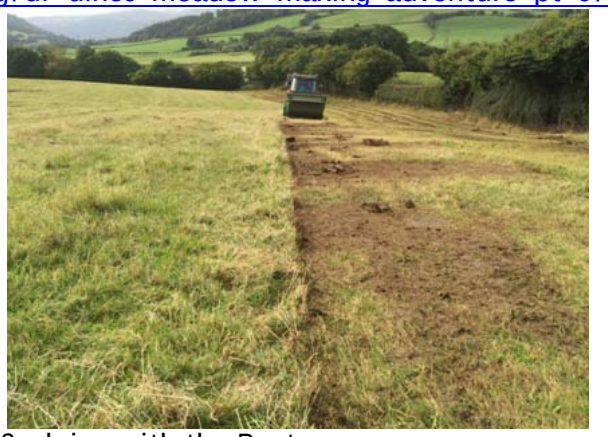


21st June 2016


Quadrat in power harrowed and seeded strip (left) and unharrowed and unseeded strip (right) 21st June 2016

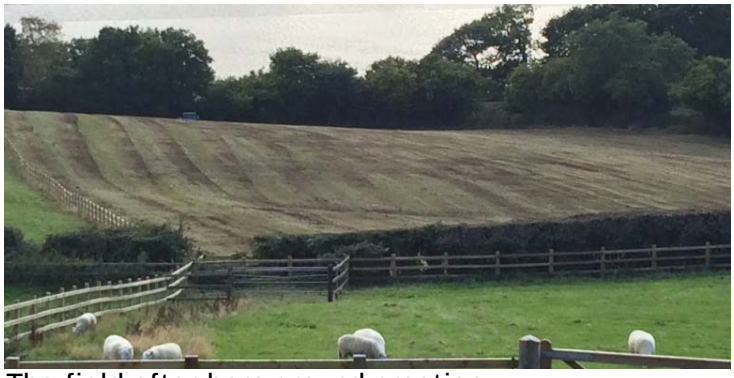
Conwy

Here experienced meadow restoration contractors Kehoe Countryside of North Wales used a Ryetec flail mower and collector to scalp a field in the Conwy valley that had significant thatch, followed by an Einbock tine harrow to create a seed bed. The process of restoration was documented by the owner (Trevor Dines of Plantlife) and can be read here http://www.plantlife.org.uk/about_us/blog/dr_dines_meadow_making_adventure_pt_9/

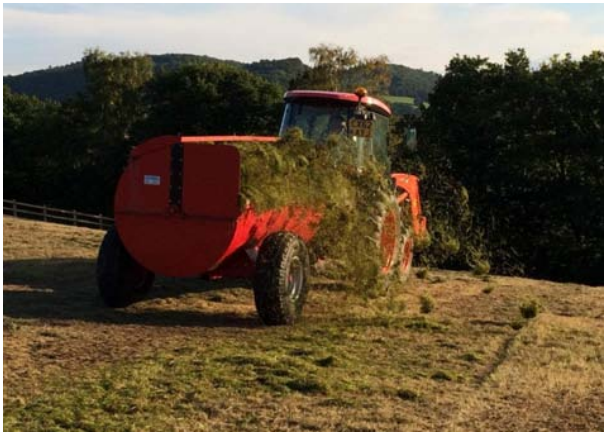
Cutting and collecting

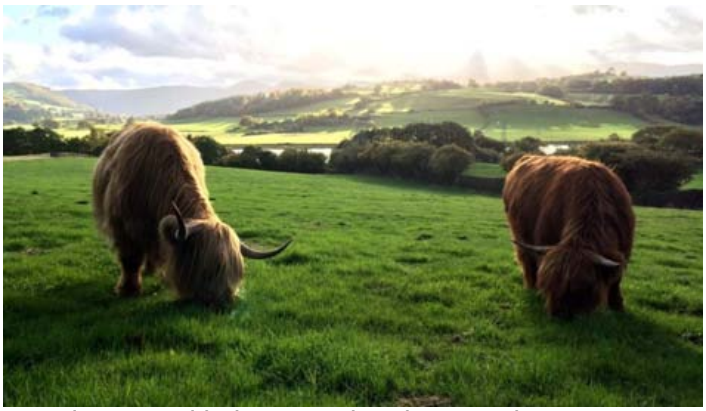
Scalping with the Ryetec

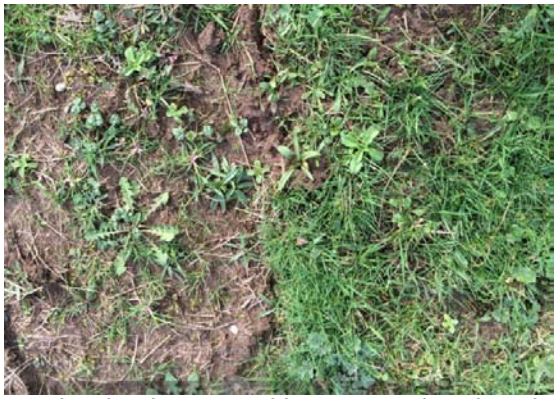



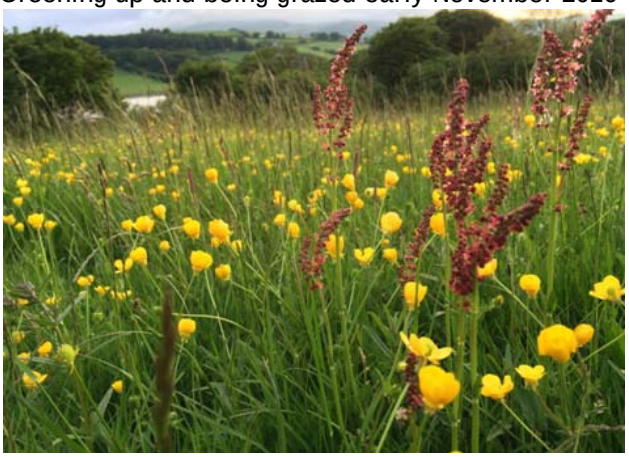
After a pass with the tine harrow

The field after bare ground creation


Spreading green hay (all works pics September 2015)

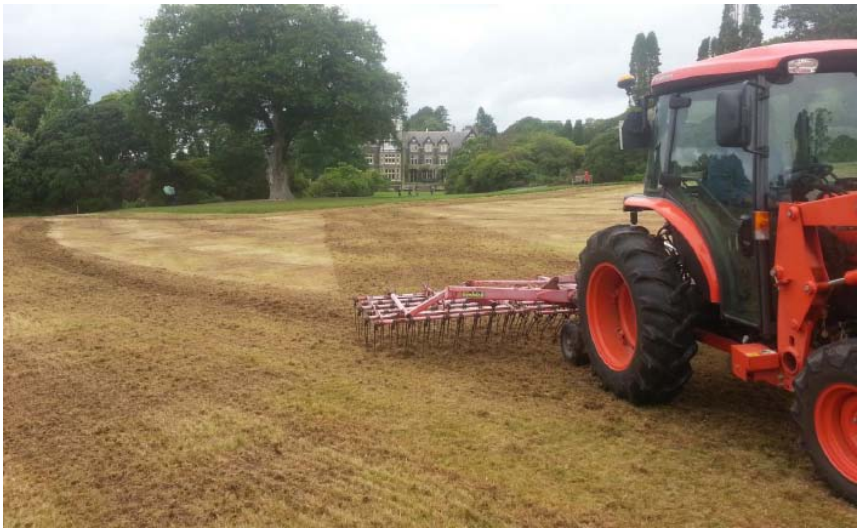

Greening up and being grazed early November 2016


Germination in areas of bare ground early Feb 2016


June 2016

Kehoe Countryside report that they sometimes find a power harrow goes too deep, disrupting the seed bed. Their preferred method is to ryetec flail collect areas which removes the thatch and scarifies the surface, and then follow on with a spring time harrow which scratches a seed bed. They used to use a chain harrow but found it didn't penetrate the ground and generally got caught on left over thatch. However they suggest they can be a good tool to use after seeding if you have an uneven coverage of green hay.

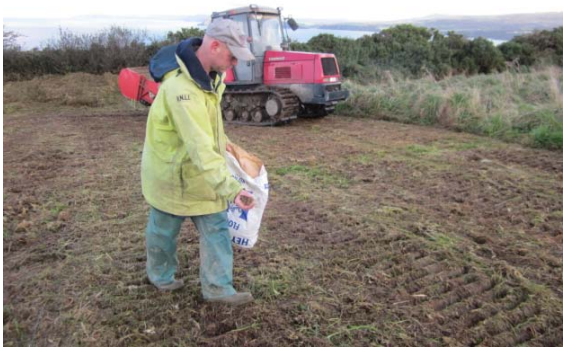
Elsewhere, outside of their Coronation Meadows project work) in 2015 they used the same methodology recently at Bodnant Gardens, cutting and baling the crop, then using the ryetec flail collector to get a closer cut and remove the feg from the surface of the grass and finally using an einbock tine harrow to scratch grooves in the surface to create a seed bed before spreading green hay and trampling in with stock as per below



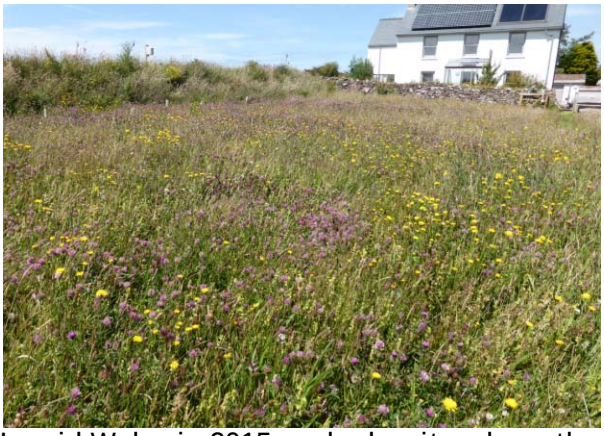
Above using spring tine harrows to create a seed bed after flail collecting with the Ryetec at Bodnant Gardens in 2015. Below the field in year1 with yellow rattle, meadow buttercup, eyebright and ribwort plantain prominent.

Pembrokeshire – other methods

Wyndrush Wild based in Pembrokeshire have used a couple of other methods (outside of their Coronation Meadows work) to suit the site and machinery availability.



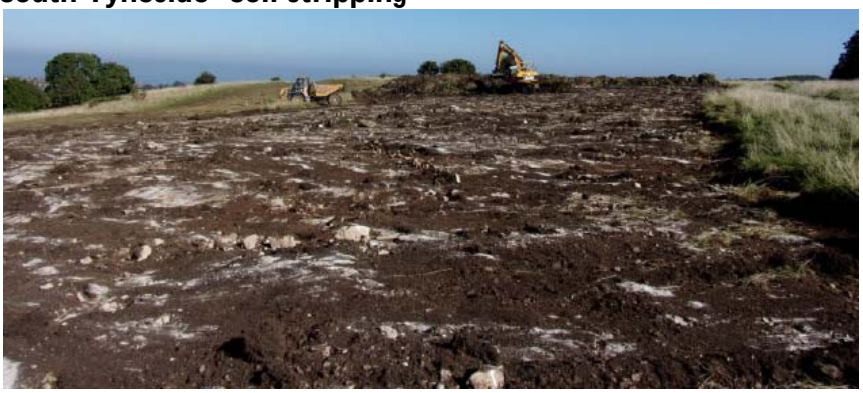
In 2012 (left) they used a Dukker flail-mower-collector mowing and scalping through neglected fairly improved grassland, while simultaneously seeding a brush-harvested mix from nearby. The tractor operator was running over the seed with his caterpillar tracks, effectively rolling it in. They report a very good take of Rhinanthus in year 1; Hypochoeris radicata dominant by year 2; Lotus corniculatus frequent by year 3 and now in yr 4 just about a harvestable donor site



In this small garden meadow project the area was mown, sown with brush-harvested seed and briefly sheep-trampled only. It produced a good take of Rhinanthus, Trifolium pratense, Hypochoeris radicata, Centaurea nigra and a few others in yr1. They point out its worth noting that mowing-only in existing meadows manages to create enough bare-ground for 100's of 1000s of Rhinanthus and Euphrasia seeds every year

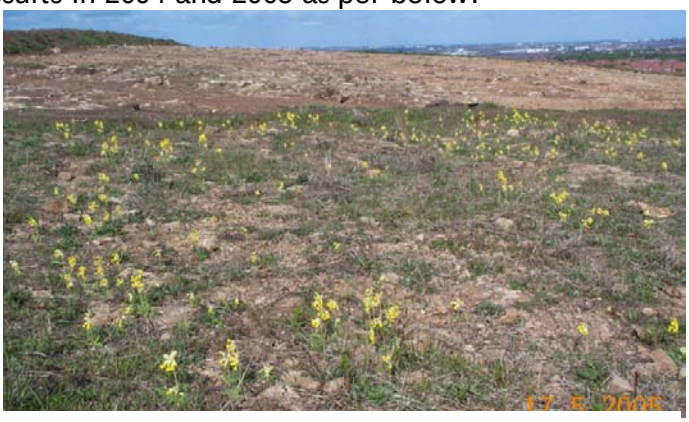
In mid Wales in 2015 we had a site where the receptor site had yellow rattle established already and when the sward was cut it was considered that there was already sufficient open ground to avoid the need for any harrowing. Unfortunately the weather was inclement and the planned seeding date had to be rescheduled by which time the sward had put on a growth spurt and bare ground was noticeably reduced. 2016 monitoring showed some encouraging signs of success but visually there was little impact, though this was also attributable to the meadow already containing the pioneer establishing species.

South Tyneside -Soil stripping



At this disused quarry site topsoil was removed down to the bedrock to restore a magnesium limestone grassland in 2015. South Tyneside Council Countryside Officer Clare Rawcliffe reports as of early July 2016 the area has weathered nicely and has target species growing including kidney vetch, yarrow, birds foot trefoil, yellow rattle and weld although they are small and very spread out, so the area still looks largely bare. There are some creeping thistle in places which will be strimmed before they set seed. The choice of soil stripping was related to the unusual magnesium limestone grassland and informed by trial plots and previous restoration work done by the council on the wider site between 2002 and 2004. In 2002 trial plots were scraped and seeded with seed collected on the wider site as well as allowed to regenerate naturally, with results in 2004 and 2005 as per below.

July 2004 trial plot scraped and seeded in 2002



May 2005 Foreground scraped 2002 natural regeneration, background 2005 scrape

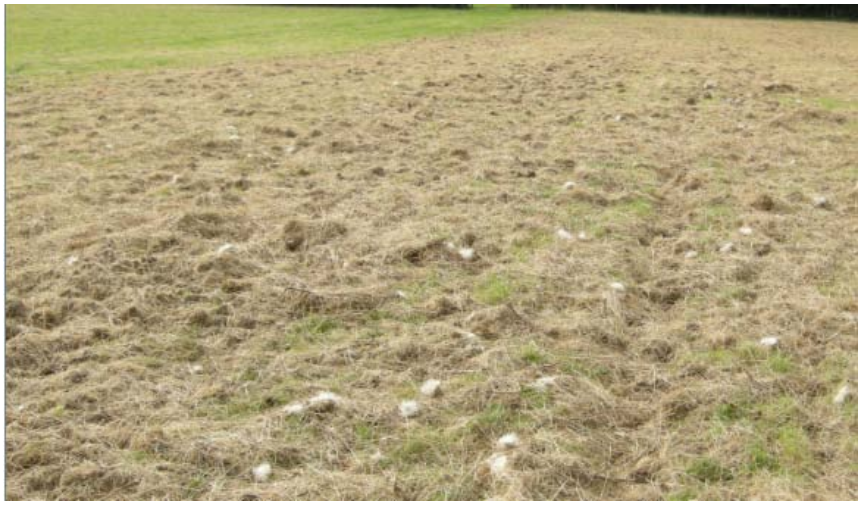
In 2004 they stripped a 1Ha area which Clare reports in the first year had some areas of creeping thistle and willowherb which were strimmed out before they set seed. They then found that certain species would dominate for a season as per below.

July 2012 Kidney vetch and rough hawkbit having a bumper year in the area that was stripped in 2004.

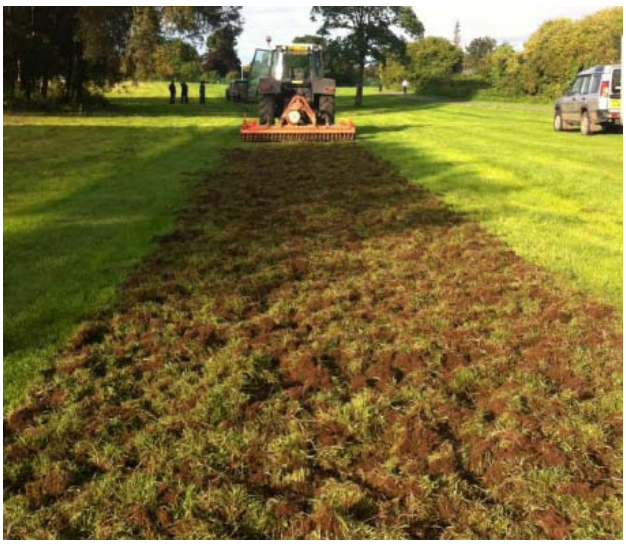
Final thoughts

A risk from harrowing is that weeds such as dock and creeping thistle will flourish through the ground disturbance. For this reason sites with a high weed burden should be avoided (ideally they should not be enhanced by any method until the weeds are eradicated to an acceptable level) or if restricted to patches in a field those patches should be treated and the remainder of the field considered for harrowing. The issue of seed blowing in from adjacent weeds should also be considered. Tanya St Pierre of the North Yorkshire Haytime project also queried whether power harrowing may have the potential to adversely affect soil fungi.

Docks in an area of power harrowed restored meadow October 2015 (1 year after restoration)



Spear thistle down blown onto green hay from neighbouring cut (but not removed) thistles. August 2015



Harrowing, particularly power harrowing has a significant short-term visual impact. At this urban park site it led to a resident writing to the local paper suggesting “even Hitlers V2 and bombs didn’t cause such widespread devastation”.