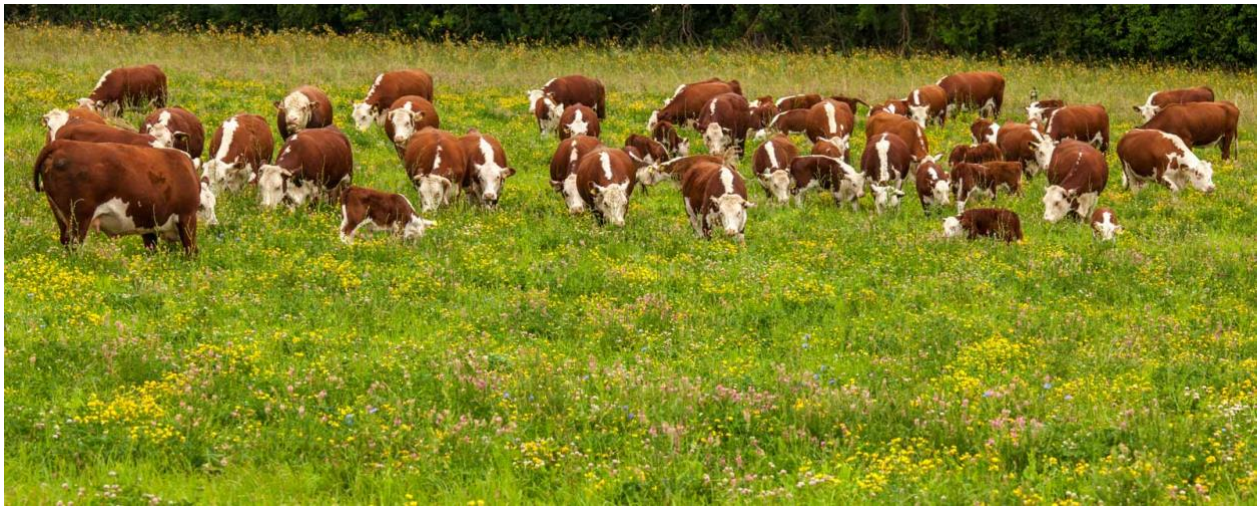

MEASURING AND MONITORING OUR ECOLOGICAL FOOTPRINT

A meeting of the PFLA South West Group (in formation)

West Town Farm (EX2 9TG) **22 February 2020**

MEASURING AND MONITORING OUR ECOLOGICAL FOOTPRINT

Introduction. This meeting took place barely six weeks after a chance remark by Andy Bragg at the ORFC…..*"why don't we have a PFLA meeting in the south west?".* So 50 of us came together for the day at Andy's Farm (for which thanks to Andy and his team) – around 40 or so farmers and another 10 specialising in some aspect of ecology. The focus of the meeting reflected my own nagging (and increasing) concern about the need for us to generate and share hard information about the ecology of our Pasture for Life farms.

The loud, and currently successful, voice in the media of those opposed to the consumption of meat and dairy produce reflects understandable concern about industrial farming, the destruction of the environment to feed that industrial machine and its apparent negative effect on the climate. It is a top-down approach that starts with the plate on our table and ends with a picture of the destruction of the rain forest or of a warming planet. It fails to recognise that the natural world on which we all depend (for food, fresh air, water and recreation) is made up of communities of plants and animals that depend upon a synergistic relationship both with each other and with the soil – without which mankind would cease to exist.

Farming is a conversation with nature

A conversation is two-sided – always to a degree mysterious; it requires faith. (Wendell Berry)

The voice of those opposing the consumption of animal products is underwritten by a number of key academic papers – many of which are meta-studies…..that is studies that are based upon reviewing a large number of other studies that impinge on the topic in hand. The weakness of these studies is that the assumptions made in the original papers may vary and that the authors have to decide which papers to include/exclude - opening the way for bias. Such studies may include data about the destruction of the forest or loss of a species but may not balance this adequately with the capacity of grazed pasture to sequester carbon. Despite this, people with data seem to be able to hold the ring.

Some years ago, when running a scheme to encourage secondary school pupils to cycle to school, I asked the pupils to identify which locations on their journey to school they found difficult or dangerous.

Over 250 of them responded and from this it emerged that there were 2-3 key places where every pupil found it dangerous. When I presented this information to a meeting of county/district council road engineers and the police there was an audible echo of "data, data!".

They explained that without hard data it is very difficult to persuade the relevant committee to allocate a budget – and that the availability of such data dispels any doubt that this is a priority that must be addressed on the grounds of the pupils' safety. That was a real lesson to me – hence my belief that it is beholden upon us to provide data from our farms that underwrites the measurable benefits of Pasture for Life.

It was pure serendipity, but exactly three years to the day before the current meeting (22 February 2017) we had a similar meeting at Fir Farm, in that case focused on how we might monitor the **pulse** of the soil – recognising that the soil is a living community. Conscious that our own pulse or blood pressure is an indicator of our general health, we asked if there are things that we could measure in the soil that would help us to monitor its pulse or general health. With some 50 farmers and 25 soil/plant scientists present, we reviewed and evaluated the options – out of which emerged a whole series of protocols for different tests – as well as in due course the Soil Mentor app. You will find the detailed report here.

However, the indicators that emerged from that exercise are essentially tools for farmers to use to better ***manage*** their own land. The question that now arises is *"what can we measure on our own farms that will demonstrate the ecological benefits of pastoral farming* ***and be persuasive to a sceptical public?****".* We already have a number of tools that can be used to record the data – including the Farm Carbon Cutting Toolkit, the Soilmentor app and the Public Goods Tool.

Are there some iconic mammals or birds or plant species that are indicative of ecological "wellness"? This meeting was a first attempt to answer this question, conscious that we could only scratch the surface and also that there is likely to be no simple answer – if any.

Around 50 people in the SW, representing different interests and areas of expertise, came together to get this particular ball rolling – knowing that we would need to continue the discussion over time. Whilst preparing for this meeting I learnt of so many people with specialised ecological knowledge, who may be able to play a role in due course – once we have identified the path we want to take. These include: the County Moth Officer, Buglife, Bioblitz, the RSPB, the Butterfly Conservation Trust, The Joint Nature Conservation Committee, Plantlife, the county centres for environmental records……and many others. Below is some feedback from an early email exchange with Andy Rumming.

In terms of indicator species the way to do it properly is walk a transect and record numbers as well as species. I have a guy do this as part of Red List Revival twice a year. However this is a skilled job so forget this. So…….
***Birds** - I would start by focusing on the 19 Farmland Bird Indicator species (which are a recognised list). So to start with farms should see how many of these 19 crop up during the year. Then how many breed or show signs of breeding (bit more tricky but do-able by anyone with a pair of binoculars).*
***Plants** - I would look at number of hedgerow species per 100m using Hoopers Rule. Any ancient or veteran trees present? Total diversity of trees on the farm, Hay meadow indictors for the soil type (easy at the right time of year)*
***Animals** - I guess you can look at top predators - Otters, barn owls, brown hares*
Insects - Get your county moth recorder (yes they do exist!) to get one of their disciples to come and do some moth trapping
***Fungi** - Less about indicator species and again more about diversity present*

Current discussions in the media around what we should eat are frequently binary, simplistic and ill-informed. My own experience is that quiet discussions, out of the glare of publicity and supported by data, can achieve change. My hope is that this is the start of an exercise that will identify a number of key indicator species that could represent the ecological benefits of Pasture for Life farming and contribute to a future quiet, but productive, dialogue. As I mentioned at the recent ORFC, quoting Star Wars *"The Empire wins by making us feel alone".* But we are not alone. Just imagine how we could turn the tide if we could provide data from 600 farms across the country demonstrating the ecological benefits of Pasture for Life farming.

Overleaf is the batting order of the day and in the following pages you will find a summary of each talk, in each case produced by a member of the audience. **Where there were visual presentations these can be found here.**

The meeting began with our traditional moment of silence – providing a space to shake off the dust of travel, to ground ourselves, to remember that we do not own the world but are guests in it and to reflect on the emerging opportunity to create a new community of pastoral farmers in the south west.

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BATTING ORDER

0945 Arrivals/coffee
1025 Introduction
10.30 Graham McAuliffe - North Wyke, Rothamsted
11.00 David Fursdon (on the RSA's study's focus on Devon - RSA Food, Farming and the Countryside transition group)
11.30 Becky Willson - Farm Carbon Toolkit
12.00 Annie Landless - Soilmentor soil health app
12.30 Jimmy Woodrow (PFLA)
1300 Lunch
1330 Adam Lockyear - FWAGSW
1400 Sean O'Hea - Cornwall Wildlife Trust
1430 Annabel Martin - Westcountry Rivers Trust
1500 Wind-up session
1530 Informal discussions and depart

Graham McAuliffe, from North Wyke (Rothamsted), reminded us first of the difficulty of getting a nuanced (rather than a binary) message through to the media. He then presented the case for focusing on the nutritional characteristics and density of individual foods and diets (rather than simply their mass) when addressing issues of sustainability and also suggested ways that farmers could reduce their carbon footprints on farms.

David Fursdon, representing the RSA's Food, Farming and the Countryside Commission and the related Devon Inquiry, summarised the outcome of their work – which include a ten-year transition plan, land-use framework, sources of finance for agro-ecological change and a focus on local soils. The Devon report has now been released.

Becky Willson presented the Farm Carbon Cutting Toolkit and the Cornwall Agritech project and the recent changes made in the light of the changing recognition of the nature of biological methane.

Annie Landless presented the Soil Mentor app and its capacity to record data from both above and below ground, including the relevant time/date and location (via GPS) as well as related photographs.

Jimmy Woodrow presented an update on developments within the PFLA and asked for ideas on how best to set up a south west PFLA group and where the first meeting might be held.

Adam Lockyear of FWAG South West outlined the emerging nature of the ELM schemes and the ecological tools that will be needed for their implementation.

Sean O'Hea outlined the work of the Cornwall Wildlife Trust in managing their 58 reserves and how they undertake their vegetation structural surveys.

Annabel Martin of the West Country Rivers Trust outlined how the trust monitors soil health and the various methods that they have found most practical and productive.

Summing up. Time was short for any kind of formal summing up but the following are the main outcomes:

- The bringing together of PFLA members in the SW (resulting in an intention to establish a PFLA group in the SW) as well as a number of professionals in the field of ecology who have a shared vision.
- General agreement on the benefits of being able to generate on-farm data about the farm's ecology – in essence **a farm eco-check**.
- General agreement that it was worth pursuing the idea of identifying potential indicator species and (when people can move freely again) the need for the participating professionals (and others) to meet again to look more closely at the opportunity/options.
- That we already have useful monitoring tools available that farmers can use now – including the FCCT, Soil Mentor app and the Public Goods Tool.
- That all members should be encouraged to sign up for the Farm Carbon Toolkit and the Soil Mentor app – conscious that if we cannot provide hard information about the carbon footprint and ecology of our farms we are poorly equipped to present the case for Pasture for Life and to counter those who oppose it.
- An exciting and new art project, focused on textiles and birds and inspired by this meeting, has emerged – see overleaf.

This meeting would not have been possible without:

- Andy Bragg and his team hosting the meeting
- Those who made presentations
- Those who summarised the various meetings
- Those who took the time to join us

Our thanks to you all.

Once we are able to move freely I hope that we can bring together a smaller group to continue discussing the options in detail.

John Meadley

Art, culture and community have been integral to the Pasture for Life movement since the start – reflected perhaps most visibly through Adam Horovitz's wonderful book THE SOIL NEVER SLEEPS. It was thus a wonderful surprise when an email came onto the forum from Cat Frampton…….*hope you are all ok? I'm self-isolating due to a weird wheezy cough illness thing.... so I've had time to think, (always dangerous). Since the recent Exeter meeting I've been mulling over the idea that quiet persuasion and art can speak in a way that shouting on twitter can't (as fun as shouting on twitter can be!) and I've had an idea....*

As a lot of you know I farm on the edge of Dartmoor and have a bunch of Angus Hereford cross cows along with wild Hebridean sheep, but what you may not know is that I am an artist. www.catframpton.com if you want to take a look. Or on Instagram or twitter under my name - Cat Frampton I work in textiles and base my work on the natural world that surrounds me. (Picture attached of one of my works) Through art I found out we have over 60 species of bird, and too many in field trees to draw and stay sane, (trees are HARD to draw) and the farm leads into my sketchbook projects, like drawing the weather everyday for over 4 years, after all, I'm out in the stuff often enough! While exhibiting I have found that a heap of people are surprised that a farmer is also a bird obsessed artist. Farmers are perceived to be on one side and art/wildlife is on the other in this divided world. Ridiculous.

Now, my idea is to make a body of work based on PFLA farmers and then have an exhibition. I would base each piece on an individual farmers connection to a particular bird, showing that not all farmers are anti wildlife in a simple quiet way, as a start point for conversations. Linking land and work and nature. To do this I would need you guys to tell me what your favourite bird is and why. I will then pick as many as I can and make a bunch of art linking you with the bird (and find an exhibition space, put on a show etc etc.) it would take a while, but ideally I would have it all sorted and ready to exhibit by January next year - do any of you know is ORFC ever show art during the conference? So, who's in? Cat

In response, over 45 farmers replied and nominated 31 of their favourite birds. A further four PFLA members who are artists have signed up – making five artists in total. Our poet Adam is in the wings as is the wonderful fiddler that accompanies him. The plan is for a touring exhibition in the Spring of 2021. That is quite an outcome from the Exeter Meeting – and thanks to Cat for making it happen.

The Climate Challenge and the Role of Livestock: are current sustainability assessments fair? [1] **Dr Graham McAuliffe**[2]**.**

Graham had recently been landed in hot water in the press due to misinterpretation of preliminary results from a study demonstrating that, under certain assumptions, Tofu had a higher global warming potential (GWP) than monogastric products such as chicken and eggs. Because the nutritional content of products can vary considerably due to many factors (including feeding regimes, soil conditions and the presence of antinutrients in some food-types) comparing the carbon-footprint of products simply on a per unit weight basis has little meaning.

Meat tends to be more nutritionally dense than plant-based sources of protein (e.g. Vitamin B12, Omega 3 Fatty Acids, CLAs, Zinc and Iron are challenging to achieve solely from plant-based diets and often require supplements). Hence sustainability assessments under the life cycle assessment (LCA) framework need to take into account the quality (digestibility and bioavailability) of these nutrients. When the carbon footprint is declared on GWP per composite Recommended Daily Intake (RDI) score of critical nutrients (also known as nutrient density scores), meat's environmental footprint may be relatively lower than when assessed on a mass-basis (e.g. impacts per kg of product), depending on how many and which nutrients are considered. Some plant-based protein-sources are also poorly digested by humans, due in part to anti-nutritional factors such as phytates which "lock up" certain nutrients. Hence we need to adjust the presentation of the nutritional quality of plant-based foods' to take into account protein digestibility as well as the digestibility (and bioavailability) of other critical nutrients. These results should, however, be interpreted with caution as there is a high degree of uncertainty when accounting for health benefits in LCA. On-going research at North Wyke is elucidating these complexities by addressing different combinations of nutrient *content* **and** *quality* across a wide range of products encompassing sources of proteins, carbohydrates and water-soluble minerals and vitamins.

Graham also presented ways of reducing farm-level carbon footprints by showing how established white clover can reduce demand for inorganic nitrogen fertiliser - thus offsetting emissions associated with both its production & application. Farm management practices such as optimising stocking rates and maximising parity per cow decrease grazing cattle's carbon footprints by as much as 30%, relative to current farm-performance at the North Wyke Farm Platform's permanent pasture system. Cattle in the UK are mainly grazed on land which cannot be used for horticultural or arable production. If we look at arable land used (ALU), rather than total land used (TLU), to assess the food-vs-feed argument then beef and sheep fare a lot better than pigs and poultry, as the latter's diets are mainly based on arable crops which could be used for human food production. Read more here. In conclusion[3]:

- Comparing GWP on weight/mass is unfair when the nutritional quality differs considerably
- We need to include Nutrient and Human Health outcomes in sustainability assessments
- Farm-level management strategies can reduce GWP considerably

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[1] Report by Luppo Diepenbroek, PFLA Member and Former Director responsible for gathering data for the https://www.pastureforlife.org/news/pasture-for-life-it-can-be-done booklet.

2. Environmental Life Cycle Analysis Researcher in Livestock Production from Rothamsted's North Wyke Research Station

[1] Editor's notes: PFLA farmers would use even less, if any Arable land on their farms, as 100% of the diet is Pasture Fed. By coupling this presentation with Becky Wilson's Farm Carbon Cutting Toolkit one, on Producing Carbon Positive Beef, we are not just contributing to Global Cooling, but also provides a healthier nutrient dense product.

David Fursdon[4]. The RSA Food, Farming and the Countryside Commission and its relevance to the South West.

David is a chartered rural surveyor, Chairman of Beeswax Dyson Farms, a trustee of the National Trust and a farmer/land manager in his own right, though his 750 acre estate is now tenanted out due to his outside commitments. He also sits on the RSA Food, Farming and Countryside Commission and has the role of Chair of the Devon Inquiry. On the Commission there are few who practically farm or look after land, so David feels a big part of his role is to say "hang on a minute" to some of the more impractical/youthful ideas

- David feels the farming industry is finding it hard to acknowledge that the worst is very bad and this is preventing honest debate and affecting the whole sector
- The RSA is funded by a charity so is independent of government - but the downside to this is the government may take no notice, so persuasion is very much part of the game for the Commission
- The main outcomes from the Commission are: a ten-year transition plan; a land use framework; sources of finance for agroecological change (a new investment bank); and a focus on local soils
- The recent land use framework discussions took place over two days and were very contentious.
- Positive ideas were butting up against the planning system (think HS2); the relationship between food, health and disease; and the potential hypothecation of NHS costs to preventative measures
- RSA is taking the view that we need bottom-up systems solutions rather than top down diktats
- 3 counties were chosen for more in depth reports: Lincolnshire, Cumbria and Devon, the latter where grasslands and livestock production were a key focus
- The conclusions of the Devon Inquiry were roughly as follows:
    - More research on grassland productivity is needed, including on public goods and biodiversity, in order to communicate better the benefits of grassland farming, particularly to the youth of the country. This feeds through into the encouragement of regenerative agriculture in all its forms
    - A focus on farmer clusters for positive outcomes, including social, marketing/supply chain and advisory services
    - The importance of farming methods for health and work was needed in the areas of nutrition, education and local procurement. So far Nottingham was the best example of this approach where a hospital had radically altered its purchasing
    - A focus is needed on new entrants to farming to facilitate inter-generational change towards agroecological practices and this needed to be focused on agricultural colleges and universities
- Where next for the Commission? Try and get the fake news out of the way so that a coherent debate around the facts can be had. And a recognition that quiet persuasion doesn't work with politicians so a groundswell of opinion was needed to advance the cause with government.

[4] Notes taken by Jimmy Woodrow

Carbon, climate and calculators. Becky Willson's talk on the Farm Carbon Toolkit[5].

- Becky runs the Cornwall Agritech Soil Carbon project From Duchy College which aims to study the relationship between soil carbon accumulation and land use on 46 Cornish Farms, and is itself a part of a larger study involving more farms across England. Many are PFLA farms. There is potential for some more farms to be taken into this project.

- Becky is also member of the team that runs the Farm Carbon Toolkit, a free service for farmers to carry out whole farm carbon audits and to make management changes which may result in better carbon, resource and financial performance on the farm. She has been working in this arena for over 10 years (as has the reviewer).

- Her talk at this event was a resume of the techniques used in the soil carbon project and its interface with the work of the North Wyke end of the Cornwall Agritech work, and a summary of the FCCT audit programme.

- In brief, the subject farms have had joint visit from a small team from Duchy and North Wyke. A series of fields is selected by the farmer as representative of his land and land use. Each field is sampled in a conventional W at an appropriate intensity. Critically this study is sampling soil at 3 depths (10, 20 and 30cm) which is a fabulous development as most agronomists would only sample at approx. 10cm (the rooting depth of the majority of conventional grass and crop varieties).

- The surveyed farms are then surveyed again at similar times in subsequent years, building a picture of the fluctuations in soil carbon through time. It is hoped that this will be able to continue for another 3-5 years so that trends can be established. From my experience on farm in this area since 2009 the difference between year one and year 2 may be inexplicable.

- Becky then went through a tour of the FCCT audit tool. What data is needed, inputting that data, and then the outputs of that data. Critically the latest version of the tool has the option to use the new methane calculations which removes methane from the CO2e as this actually exaggerates the climate forcing of methane.

- My own message on this to ALL farmers is: that until we know how our individual farm is performing on GHG emissions we cannot work on significant reductions; the process will help to improve financial performance of the farm and that which performs well on emissions will also be performing well on other VITAL indices like biodiversity, flood risk etc – DEFRA, FWAG, Natural England and others please take note. The PFLA way of farming is fundamental to good greenhouse gas performance.

[5] Summary by Chris Jones (PFLA founder member)

Annie Landless on Vidacycle/Soil Mentor[6]

The founders of Vidacycle recognised from their own farming experience that there was a need for technological solutions to monitor on-farm situations.

Their app, the Soilmentor soil health app, is aimed at helping farmers learn what healthy soil and biodiversity look like through a series of indicators above and below ground and (newly added) biodiversity.

Below ground the focus is on soil biology and soil health with assessments of soil structure and soil aggregation.

Above ground the density of the swards, presence of different species (desirable and undesirable) and bare soil are recorded.

The software makes it easy to carry out the observations and enter the test results. Photos and notes can be stored on a field's records, and GPS co-ordinates recorded so you can return to the same spot at a later date to see how test results vary.

There are tools to help get further insight from your data: for example the earthworm index tool will chart how your earthworm numbers change over time and benchmark them against UK figures.

For biodiversity all wildlife can be recorded from mammals to birds, butterflies and other invertebrates.

There are three ways of recording biodiversity – ad hoc recording what you see when you see it; a transect walk where you start from the middle of the field and walk to the edge alternately doing 5 minute recording sessions for birds, mammals and butterflies and invertebrates; and a sample quadrant where you stay in one place and record what you see.

Over times it should be possible to see how farm management impacts on different species found on the farm. ***The summary on the app lists the most and least common species found on farm and highlights any UK species of concern and biodiversity farmland index species.***

[6] Summary by Anna Heaton

Adam Lockyear, FWAG South West[7]

- New agricultural support regime involves a phasing out of BPS and existing environmental schemes and replacing with ELMS – Environmental Land Management Scheme.
- The new scheme identifies 6 public goods to be promoted alongside primary food production:
    - Clean and plentiful water
    - Clean air
    - Protection from, and mitigation of, environmental hazards
    - Mitigation of, and adaptation to ,climate change
    - Thriving plants and wildlife
    - Beauty, heritage and engagement with the environment
- ELMS is currently in a national pilot phase until 2024 and will be rolled out from 2025; BPS will be phased out over the period 2021-2027.
- RPA refers to ELMS as a contract between farmers and society as a whole, although the detail of this is unclear
- Schemes will be tiered like ELS/HLS; they can also be developed/ integrated on a wider scale than individual farms, to cover whole landscapes
- A first step on putting a scheme together will be describing what's there; a range of tools are relevant e.g.
    - Mapping tools – Magic holds some useful data about habitats of interest
    - Local records centres like Devon Biodiversity Records Centre
    - National Biodiversity Networks
    - Handbooks – Francis Rose on wildflowers, Collins pocket guides, FSC guides, Hubbard on grasses
    - Local groups may help in relation to moths, butterflies, bats, small mammals
    - For valuable habitats it may pay to get a survey done
- Then develop and implement a plan which works with your habitat and prioritises areas of biodiversity
- Groups like Farm Wilder can also offer an environmental angle which may be helpful
- Scrub and edge environments are critical – ponds, woodlands, hedges etc.
- FWAG is also keen to work with FCCT, Farmbench and other farm support and consultancy groups

[7] Notes taken by Alexander Fraser

Sean O'Hea of Cornwall Wildlife Trust[8]

- CWT manages 58 nature reserves across Cornwall
    - Mixture of heathland, sand dunes, reed beds, fern, woodlands, farmlands

- 20 of their sites are grazed by cattle, contractually by farmers
    - Wilder Beef Project: their role is telling the true story of the animal and the benefits of ruminants alongside wildlife conservation. The result is properly marketed beef, a good interest from the public and a fair price for the meat

- Rosenannon (110 ha. Grassland)
    - This site hadn't seen any management for years, until grazing facilitated by the CWT
    - Before grazing: Poor grass covering, lack of diversity in vegetation
    - Once grazing had begun, they started monitoring the progress, using simple tests and volunteers to undertake the monitoring work
    - After 5 years of managed grazing, there was both better vegetation coverage and more diversity in the vegetation

- Beneficial ecological principles learned:
    - Diverse structure = long and short swards
    - Diverse vegetation = different grasses, pasture, shrubs etc.
    - Healthy cow pats support vast numbers of invertebrates, which in turn support a greater number of wildlife

- Note the detailed report on the Rosenannon vegetation structural surveys (and how the data is recorded and presented – here).

[8] Notes taken by Tom Odgers

Rosenannon Vegetation Structural Surveys – the purpose of this monitoring

Cornwall Wildlife Trust owns or leases 55 nature reserves across Cornwall. The work of managing these sites for wildlife and for the public is carried out by members of the Reserves team. The Trust carries out a wide range of other work across the county including exciting landscape scale projects, looking beyond our boundaries to the broader countryside, and marine conservation.

Much of the management of Cornwall Wildlife Trust nature reserves has been carried out according to broad principles appropriate to the habitats present. These principles are often set out in our management plans which can at times have a 'one size fits all' approach. As managers we have to prioritise across multiple sites, and with limited resources the textbook management often cannot be delivered. Decisions about whether a site needs more or less of something have been informed mostly by experience (also known as gut instinct) and advice from external partners and funders, such as Natural England.

Many people monitor our reserves, often particular interest groups like Cornwall Bat Group or Cornwall Butterfly Conservation, as well as numerous expert individuals who have a particular interest in our sites. These observations and data could be, and often are, very valuable but often their potential is not realised. In many instances we do not receive the data, it is kept privately, or by other organisations. The data is sometimes sent to the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS), an organisation hosted and managed by Cornwall Wildlife Trust. Despite being held on the same premises, we do not have a system in place for us to be automatically notified if somebody submits data from a site we manage – an area where we definitely need to put some work in. The reality is though that even if we were swamped with data it's unlikely we'd have the systems, the time or the expertise to draw out anything of immediate use from it.

What we as the site managers want and need is a system which directly informs our management decisions. For example: To provide a crude summary of our management across heathland reserves, it involves all or some of the following:

- Cutting (scrub or the heathland itself),
- Burning (also known as swaleing)
- Grazing
- Digging / scraping
- Non-intervention

We need to know whether we need more or less of any of the above. What we are trying to achieve is a habitat in prime condition for the broadest range of wildlife or, if a particularly important species is present, appropriate conditions for this species to thrive. Where a particular species is singled out as important then its abundance can be a clear indicator of whether we're getting our management right, if we have a detailed knowledge of what that species needs. If we're looking for a good example of a particular type of habitat then it's not quite so straight forward to identify whether we're achieving what we want.

As site managers I think our greatest strength is an ability to maintain an overview of a site's requirements whilst drawing in information from many specialist sources to make balanced decisions. We often have a reasonable general knowledge of many wildlife subjects without necessarily having a speciality – we're 'specialist generalists'. We should however be experts in habitat management. Ecological data can often be a bewildering array of Latin names and figures which of course has its' place. The data we need to make decisions about a sites management should be simple and directly related to what we're trying to do.

As a broad principle, a heathland in Cornwall should have a good age range of dwarf shrubs (heathers), patches of bare ground (good for invertebrates) a varied vegetation structure (long and short vegetation across the habitat) and no one or two species being overly dominant (bracken, gorse and purple moor grass for example). As managers we need to know what effect any management has had and how far reaching it has been, what is the composition of vegetation present and how long it is. This is a very simplistic overview, but essentially it's what we need to know. So, we've adapted monitoring methods used by colleagues from the National Trust with school groups, from which they've produced simple graphs which tell us as managers what we need to know. What we want is this dataset to be produced each year so that we can look back and see whether our management is producing the desired effect. In the cases of Rosenannon and Tregonetha Downs, the habitats are at the point of a change in management following many decades of neglect, so it's an exciting time to be building this data up.

In summary, we want monitoring which is:

- Simple
- Repeatable by different people
- Informative, and
- Easy to analyse.

Method brief:

10 Fixed transects
Marked by GPS Coordinates and peg with bearing
60' long, sample every foot – using imperial for convenience, 1ft about the right spacing.

Record what's rooted at 1' intervals

Classify as:
Grass
Heather
Gorse
Good other (e.g. lousewort, bog asphodel, devils bit scabious)
Bad other (e.g. bramble, willow, birch, bracken)
Bare ground

Measure height of general vegetation at each point using metre rule, record in cm using drop disc.

Recording form
Space for notes/tick box : IE: footpath, bad herb ID, good herb ID, burned etc., evidence of grazing – cow pat, munched grass, poaching.

Photograph to be taken along transect
Record camera make and lens range, photos to be taken fully zoomed out
Transect locations chosen from NVC mapping and aerial photos
Good spread across site

Transects to record:
Good spread – monitor grazing levels across site
Different NVC's
Transition from one NVC to another
An area frequently burned
An area infrequently burned
A run across a fire break
Sloping site
Flat site

Compiled into forms and entered into spread sheet
An example of what that looks like and how the data can be converted into a visual representation can be found here.

Displayed in graph form - written up and repeatable by anybody

Equipment required:
Digital camera
Handheld GPS with waypoints stored
Transect marker (shelf brackets)
Surveyors tape – 100'
Compass
Metre Ruler
Drop disk
Peg
Data sheets
Pencil
Clip board
Table of transect locations
Transect location map
Wildflower ID book (optional)
Sun hat, sun cream, wellies
Mobile Phone
Risk assessment

Soil Health Monitoring by Annabel Martin - West Country Rivers Trust (WCRT)[9]

- Type of soil monitoring depends on the funding available, Annabel's work is funded through 'Upstream Thinking'
- Usually soil assessments are seasonal, but due to time pressures, these have been carried out throughout the winter – muddy business!
- There is a suite of soil tests that can be done to assess the health of soil. Annabel does a selection of these due to her time restraint, but other colleagues undertake other variations, these include:
    - Erosion risk management
    - VESS (Visual Evaluation of Soil Structure)
    - Earthworm count
    - Infiltration tests
    - Soil samples including standard P,K, Mg, pH as well as soil organic matter
    - Soil organic carbon (using bulk density of soil)
    - Slake testing
- The soil monitoring method chosen is determined by end use.
  Motivation for farmers include:
    - Benefit to crop growth
    - Assessment over time to give trend information
    - Carbon sequestration

  Motivation for WCRT
    - As above
    - Rainwater acceptance
    - Erosion risk

- Comparison of various soil monitoring methods:

Method	Comment
Erosion Risk	Depends on: soil type, use, % bare ground, whether it is a sealed surface, limiting layers, slopes/pathways/receptors such as roads
VESS	Great for categorising soil/putting numbers on soil! Looks at the structure and friability of soil, is it angular or rounded? Identifies limiting layers (compaction) – is the compaction at a level that requires intervention?
Earthworms	Time consuming, seasonal variation, compacted soil may still have large effect on numbers of earth worms
Infiltration Tests	Time consuming, careful how to set up experiment so as not to create artificial compaction, requires multiple tests per fields to eliminate variability

[9] Notes taken by Wendy Couch (National Trust)

Slake Test	You need to be organised (need to dry soil out), have appropriate kit with you, comparisons across different soil types is difficult
Soil Carbon	Very time consuming, soil wetness is a big issue, requires kit, lab costs, great for comparison as you get a figure, but don't want to deter sandy soil farmers!

- Top 5 tests – consensus from WCRT staff
    - VESS
    - Earthworms
    - pH
    - Soil Carbon
    - Slake test

- Work projects at WCRT
    - Channel payments for ecosystem services (EU partnership project)
    - Improving river catchments
    - Education