The Water Standard

The Voluntary Farmer Led approach to Nutrient Management Initiative

The Farmer Led Approach is a forward looking, industry wide project whose aim is to create a pan – Wales nutrient management approach that is accessible to all farmers in all farming sectors.

The Water Standard is a concept paper developed by industry to provide guidance to potential operators of assurance schemes of methods that could be used to deliver outcomes which maintain and improve water quality.

Document No. NFU/NRW: WS:001
Author: Lorna Davis MA hons / Nsch.

Table of Contents

Our Vision

The Water Standard is underpinned by a common desire by industry partners to establish a comprehensive guide for farmers to minimise adverse impacts, and demonstrate the benefits farming systems have on the environment, the rural economy and society as a whole.

Wales' waters provide social, environmental and economic benefits to our landscape, communities, and culture. In line with the Welsh Government and Natural Resources Wales Sustainable Management of Natural Resources approach the project looks to support farmers in protecting this valuable resource by delivering the following benefits:

- **Maximising natural resources** on farms across Wales
- **Fewer agricultural pollution incidents** and less diffuse pollution
- Better **water, soil, air and habitat** quality
- Making **better use** of **nutrients** on farm and within the industry
- Developing methods to **combat climate change**
- Developing **market advantages** by demonstrating **sustainable production standards**

The Water Standard is an expression of the industry's commitment to self-improvement. It also recognises that agriculture's actions and expectations do not exist in isolation of other parties. The common goal to deliver better water quality depends upon all sectors working together to better understand the issues and challenges we face and address them accordingly. In this way the Water Standard provides agriculture with a collective expression of intent created to;

- align agriculture with other industries in better evidencing their management of risk,
- explore opportunities to deliver multiple social, environmental and economic responsibilities within Wales
- Deliver these outcomes for the benefit of Wales' and the wider enviroment across the globe.

Benefits

The Water Standard provides a guide for the development of a voluntary, farmer-led nutrient management approach in Wales. This includes the structure and content for farmers to deliver;

- ✔ **Whole industry engagement** into the design and delivery of the project
- ✔ **Raised awareness** of the benefits of nutrient management & water quality
- ✔ **Improved surface water, groundwater and soil quality** across Wales
- ✔ **Improved farm business resilience** to environmental and economic challenges
- ✔ **Water quality guidelines** to provide marketing opportunities for food production and public goods and services
- ✔ **Improved data collection** and evidence on impacts affecting water quality / quantity
- ✔ Create a **nationwide programme** to reduce the risks of nutrients impacting water courses and ground water supplies

Introduction

IN THIS SECTION:

- Introduction
- Background
- Our Vision
- Benefits
- Tackling Agricultural Pollution - WLMF progress report
- NRW - 5 key Agricultural pollution measures
- The FLA project deliverables
- How the standrd works
- The Water Standard Process Map
- Next steps
- 5 step Plan
- The benefits of using Earned Recognition to deliver the Water Standard

Introduction

The aim of the Water Standard is to provide farmers with a set of comprehensive and robust measures to be delivered on farm, by which they can protect and enhance Wales's water environment. The Standard is intended to provide a method of evidencing behavioural change and good practice, so promoting continual improvement of water quality.

Background

On 13th December 2017[1], to ensure water receives greater protection from agricultural pollution, the Cabinet Secretary for Energy, Planning and Rural Affairs, Lesley Griffiths AM, stated that she was minded to introduce a whole Wales approach to tackling nitrate pollution from agriculture. She stated that further work with stakeholders would be undertaken to achieve the right balance of regulatory measures, voluntary initiatives and investment, with a commitment 'to explore options for providing land managers with flexibility, where these would achieve the same or better outcomes than a regulatory approach'. This approach accepted the offers made by the farming unions to explore alternatives to NVZ designation.

The approach is also in line with NRW's working definition of regulation[2] as an intervention that makes a positive difference, one which includes other synergistic mechanisms of bringing about positive change alongside formal regulation underpinned by legislation, such as stimulating voluntary initiatives and targeted investments.

The Voluntary Farmer Led Approach to Nutrient Management Project was developed through **Recommendation 4.9** of the 'Tackling Agricultural Pollution' – Progress report[3] by the Wales Land Management Forum (WLMF) sub group on agricultural pollution. Their aim is to explore options, including the potential to develop a farmer-led approach delivering water quality improvements, and reducing nutrient enrichment caused by nitrates, phosphorus and soil particles within the broader framework of advice, investment, regulation and innovation.

The project aims to deliver water quality objectives whilst also maintaining and enhancing farm business viability in line with the Well-Being of Future Generations Act and the economic, social, cultural and environmental well-being of Wales.

A funding partnership was formed between Natural Resources Wales and NFU Cymru to engage a project manager to develop a voluntary farmer-led approach to nutrient management. This is supported by two advisory boards, the Steering board and Water Quality Task and Finish group (WQTF).

The Steering Board is made up of representatives from NFU Cymru, Dŵr Cymru (DCWW), the Farmers Union of Wales (FUW), Natural Resources Wales (NRW) and Welsh Government (WG). Alongside this is the WQTF group, this is made up of farmers and professional advisers covering all sectors and all areas of Wales. The role of the boards is to provide direction to the Project manager/technical lead to develop work packages and scrutinise the deliverables made.

1 https://gov.wales/written-statement-nvz-consultation
2 http://naturalresources.wales/about-us/what-we-do/how-we-regulate-you/regulatory-principles/?lang=en
3 https://cdn.naturalresources.wales/media/685890/interim-report-from-wlmf-subgroup-on-agricultural-pollution-final.pdf

Tackling Agricultural Pollution - WLMF progress report

The Wales Land Management Forum (WLMF) established a sub-group in January 2017 in order to focus on tackling agricultural pollution. The membership of the group comprises of NFU Cymru, Farmers' Union of Wales (FUW), Country Land and Business Association (CLA), Dwr Cymru Welsh Water (DCWW), the Tenant Farmers Association Cymru (TFA), Hybu Cig Cymru (HCC), AHDB Dairy, the Carmarthenshire Fishermen's Federation (CFF), Natural Resources Wales and the Welsh Government.

Lying at the heart of the work has been the development of a mutual understanding of the root causes of agricultural pollution problems. This preceded the identification of a range of approaches capable of driving environmental improvements.

In the development of this proposal the WLMF sub-group on agricultural pollution committed a significant amount of time and resources to working collaboratively to better understand evidenced root causes. This developed an integrated response in the form of the WLMF Ag. Pollution Sub group Progress report 2018 to tackle agricultural pollution in Wales, in line with SMNR principles. The findings of this group were clear that there is no one simple solution to tackling agricultural pollution, so they recommended 5 key measures;

1. Explore voluntary approaches to nutrient management, and the willingness within industry to work with stakeholders to develop this

2. Advice led, targeted approach to drive improvements in water quality and reduced agricultural pollution. (This will take time to translate into reduced pollution incidences and improved overall water quality).

3. A need to improve the range of investment opportunities for farmers. (This has a key role in reducing the number of incidences of agricultural pollution).

4. Industry wide innovation and the application of new technologies and techniques. (This has a key contribution to make in addressing a range of water quality issues on welsh farms).

5. A simplified, rational regulatory landscape, designed to achieve an outcomes based approach to regulation for NRW & the industry.

The report's recommendations range from the strategic to the practical, with a total of 45 initial recommendations spanning the 5 work themes adopted by the group. It has been identified that it will require significant further work, resources and commitment from all of partners involved in the process, with all efforts needing to be aligned to tackle the complex range of issues that result in the current levels of agricultural pollution in Wales.

Aligning with the 5 key Agricultural pollution measures

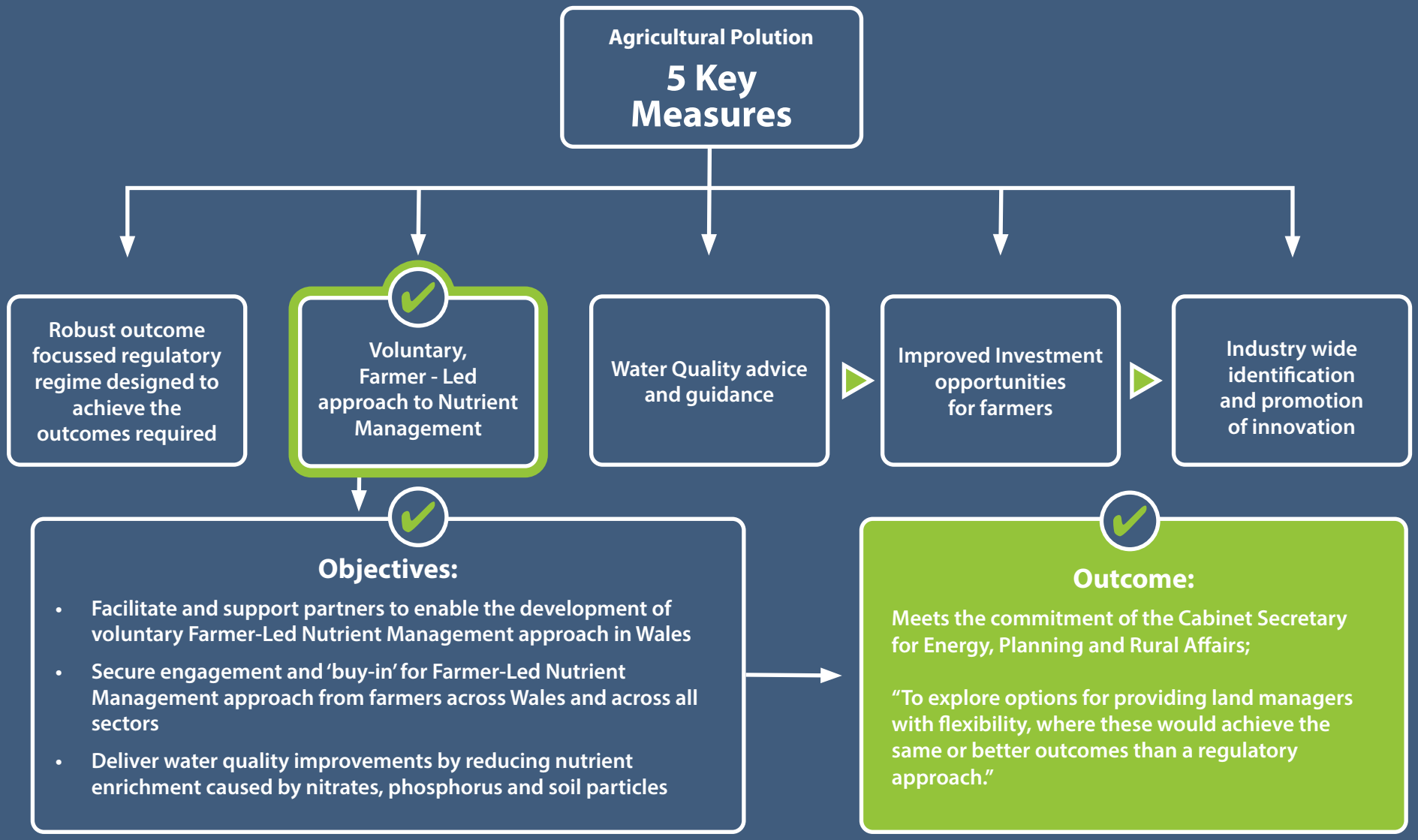


Table. 1. NRW 5 Agricultural Pollution key measures and the deliverables the FLA project has achieved within it's 12 month period. Source: July 2019 NRW board paper. Co-produced by Lorna Davis (project manager for the FLA) and Sarah Hetherington NRW's Lead Specialist Advisor Agriculture.

✔ = **2019 Project Deliverables**

The FLA project deliverables

During the past 12 months the project has travelled the length and breadth of Wales working with industry to develop the Water Standard content, understand the challenges and opportunities industry has to work within, and create a picture of the social and environmental baselines industry has created within their farm environments. Within the project deliverables a report accompanies the Water Standard outlining the following work packages;

1. Guidance to provide clear direction to potential operators of voluntary, farmer-led approaches to nutrient management.

2. Partnership working to support the development of individual operational frameworks for voluntary farmer-led approaches to nutrient management that satisfy the requirements of the regulator and industry.

3. Farmer 'buy-in' and participation in voluntary farmer-led approaches to nutrient management through comprehensive communication and engagement that includes a specific focus on 'hard to reach' and digitally excluded.

4. Co-ordination with the wider policy agenda and delivery within the framework of the Brand Wales Concept so that water quality is included as one of the underpinning values within a sustainability brand and the 'standard' for water is defined.

FLA model and engagement material

3 x Farming connect Agrisgop Meetings

9 x Steering Board Meetings

5 x NFU Cymru County Meetings

Water Q. Seminars

Royal Welsh Show Government engagement

7 x County Shows

Collaboration across Unions, NFU Cymru / FUW

How the standard works

The Water Standard is intended to provide a method of evidencing behavioural change and good practice, so promoting continual improvement of water quality.

This includes:

- ✓ Promote good practice in managing fertilisers and soils
- ✓ Encourage farmers to take reasonable precautions to prevent diffuse pollution from runoff or soil erosion

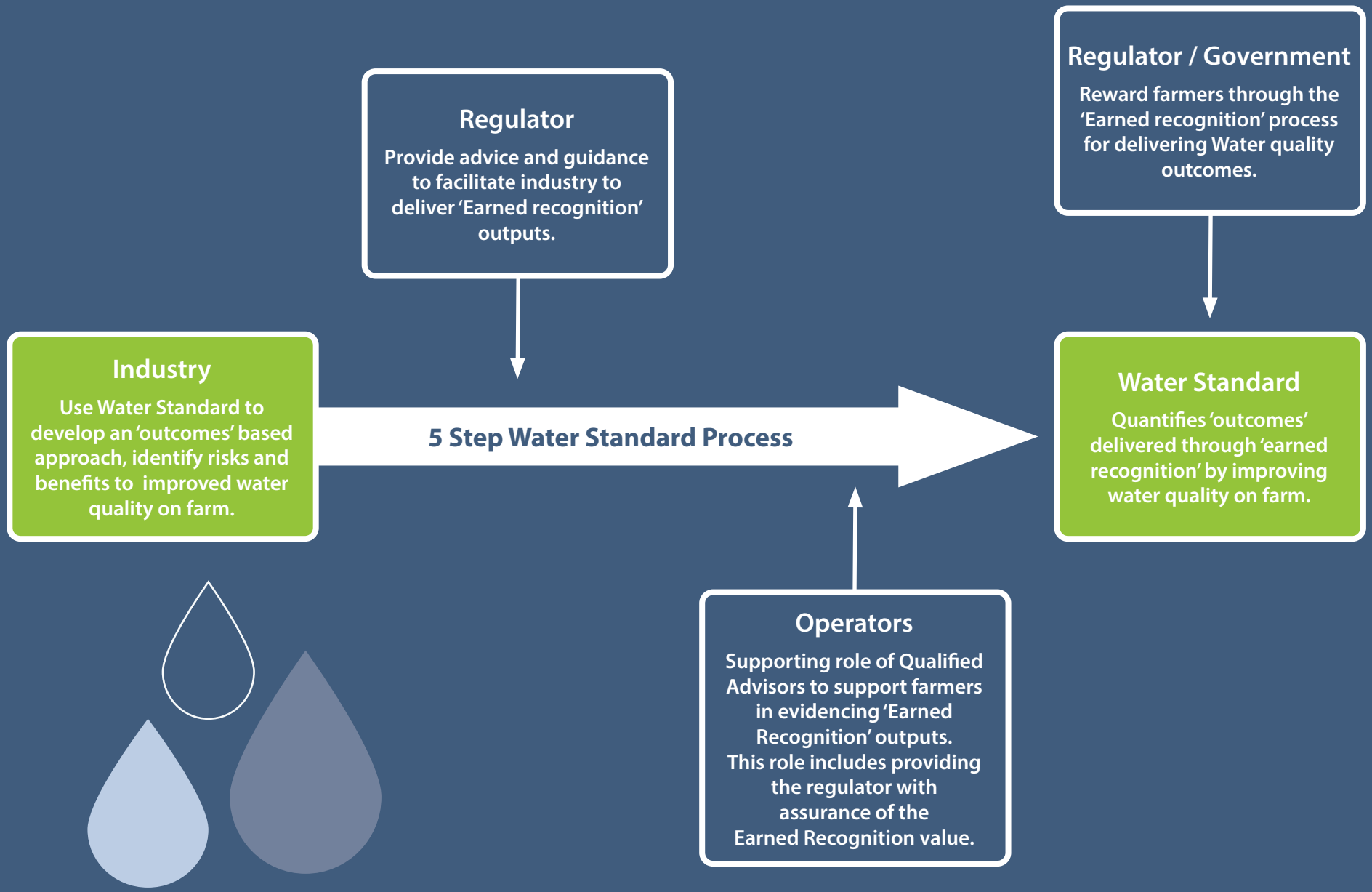
The Water Standard document informs farmers of the method and means to identify risk on farm, embracing all sources of pollution and quantifying the risk. In identifying risks, the farmer is then able to take action to manage these in an appropriate manner. Actions may vary from very basic, to quite complex.

To begin with the farmer is encouraged to gather and understand information about best practices for use in establishing their plan. By providing access to the wide range of information on best practice for improving water quality there is a mechanism for **Continuous Improvement**. This will drive farmers to develop their aspirations of social, environmental and economic outcomes which can be evidenced through increased Water Stewardship over time.

Through individuals understanding the value of their water stewardship outcomes there is an opportunity to map the benefits and impacts this could have at a catchment level through collective action. Some catchments will need collective action in order to achieve a desired social, environmental or economic outcome. This drives the need to reward individuals for their efforts over and above a sensible regulatory baseline.

The Water Standard provides a framework for operators to engage with and deliver collective action, supporting and contributing to existing catchment initiatives, and not to replace or compete with them. This aligns with NRW's objectives and outcomes. The emphasis is for good water stewardship to be delivered as collective action within a catchment, inclusive of the farmer and other relevant stakeholders impacting on water quality.

The Water Standard Process Map



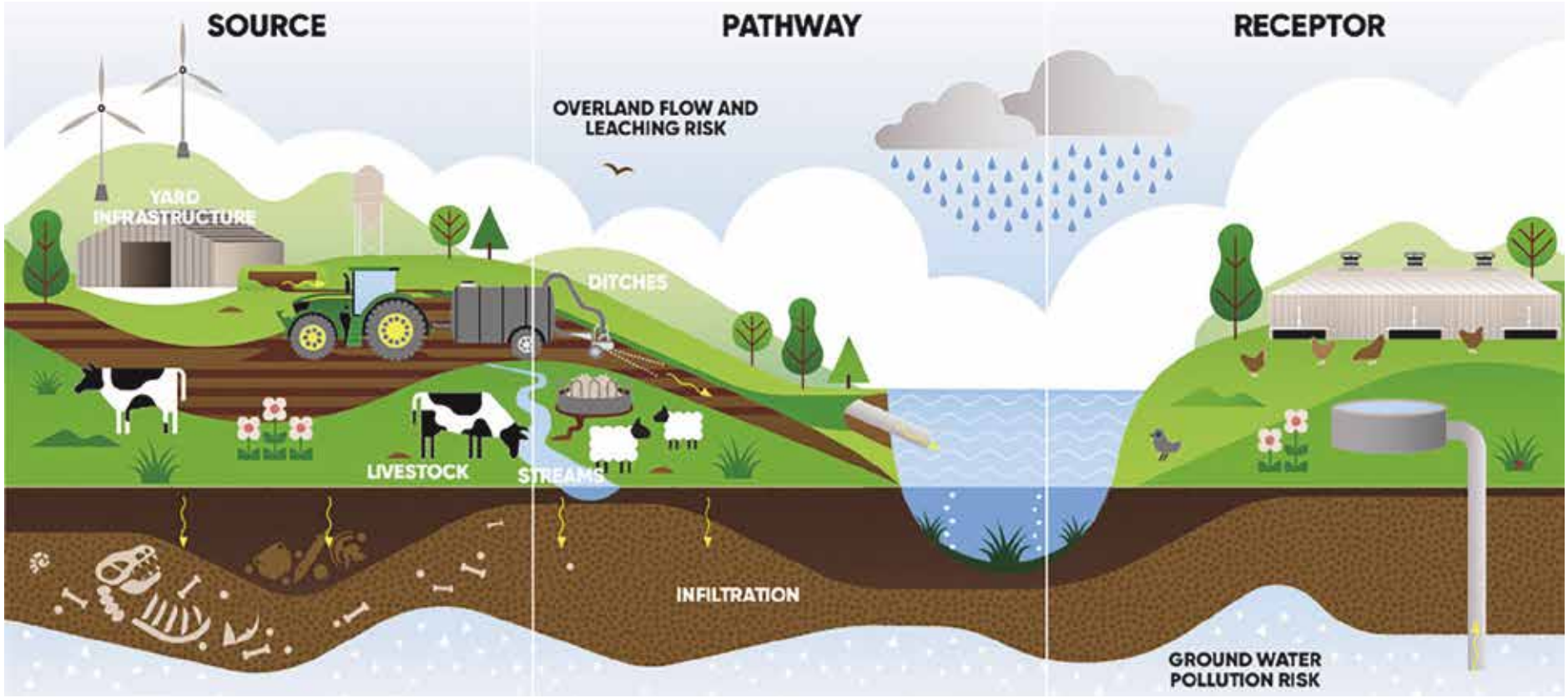
Next Steps

The identification of risk on farm is the key to the delivery of a Voluntary Initiative. Through the development of advice and guidance supporting the Water Standard, farmers can be provided with the opportunity to identify risks associated with N,P,K and soils, then evidence activities with regards to nutrient management on farm.

By providing an approach which embraces environmental, social and economic benefits farmers are able to identify drivers which deliver multiple benefits to environment and water. A toolbox of solutions is required to enable farmers to capture these risks and opportunities easily, so supporting farmers in the identifying risk of nutrient losses on farm through:

- ✓ Identifying sustainable best management practices to address risks
- ✓ Quantifying production and environmental improvement goals
- ✓ Developing a realistic timescale to deliver affordability and business resilience.

In understanding the financial rewards for managing nutrients on farm, farmers are then able to calculate the business benefit of acting on nutrient management and identify / implement a suitable remedial action to manage these risks, and mitigate where possible.



5 step plan to delivering water quality through the management of nutrients on farm

Within the development and delivery of a Water Standard there are a number of steps farmers must undertake to identify the levels of risk they pose to water quality within their farm environment, and the wider catchment. This is followed by the steps they might undertake to manage and mitigate these risks, evidencing how they are committed to delivering water quality within their business, therefore accessing the benefits of the Earned Recognition scheme.

Step 1 Gather and Understand

Using the options within the Water Standard to identify existing on farm activities / infrastructure which are related to the criteria and quantify the level of risk they pose to the water environment through completing the risk register.

Step 2 Commit and Plan

Identify the options for improvement within the risks identified and develop proposals which are relevant and practical using the Water Standard document.

Step 3 Implement

Designing solutions – through the provision of solutions provided by the tool box farmers can identify their chosen methods to address risk, and the costs associated with delivering elements of the Water Standard. This could include capturing the provision of environmental enhancements.

Step 4 Evaluate

The tool box enables farmers to undertake a comprehensive assessment of risk using guidance provided within the supporting literature, and electronic mapping tools.

Step 5 Communicate

To enable auditing of the Voluntary Led approach farmers are required to select the data they have agreed to share and upload this onto an authorised 'data sharing' system (paper based and electronic). Sharing evidence with the 'operator' monitoring farm performance enable access to Earned Recognition'. This creates a 'working relationship' to managing risks, develop timescales for delivery and evidence work completed.

The benefits of using Earned recognition to deliver the Water Standard

The Water Standard uses Earned recognition to find ways to reduce the administrative burden of regulation on those who have a strong track record of reliability and adherence to standards. It does not necessarily mean a reduction in the total number of on-farm inspections, but rather an opportunity to improve targeting of those inspections to where the risks of non-compliance are highest.

In considering earned recognition we must ensure that;

- Safety, animal welfare and environmental standards are protected.
- Where used, recognised third party inspections are demonstrably robust, independent and subject to robust checks and controls.
- Introducing earned recognition should be fair and proportionate, undertaken in consultation with interested parties.
- Regulators remain fully responsible for enforcement and sanctions.

The Water Standard provides a conduit for evidencing these good behaviours, using methods to measure improvements through a certified, auditable system. This encourages farmers to earn an element of autonomy based on past performance and trust, This mimics the military approach for Frontline Troops to; Observe, Decide and Act and is replicated in the structure of the 5 Step plan to deliver water quality on farm.

Rewards

Through aligning the outcomes of the Water Standard with Brand Wales and Future Food and Farming policy, these outcomes can be linked to payments for sustainable food production.

These outcomes are designed to be compatible with the development of CAP replacement schemes, designed to avoid unintended consequences, and achieve key aims including reduced emissions of greenhouse gases and ammonia.

Going forward the financial and regulatory benefits to the farmer for showing compliance with the Water Standard would deliver the outcomes regulation is looking to deliver of 'Improved Water Quality'.

Note: A measurement of success to improve water quality should directly relate to the percentage of impact farming is having on the surface and ground water it interacts with.

The Water Standard Deliverables

Introduction

The following chapters outline the content of the Water Standard and the sources identified though the projects research.

The aim of this is to provide farmers with a one stop shop of 'good management practices' to develop a sustainable nutrient management system on their farm. The chapters include examples of existing advice and guidance, supporting farmers to develop and deliver a **risk based** approach to Nutrient management within the farm environment.

Who decided what the good management Items/ Outcomes are?

The Water Standard has been written to provide farmers with a comprehensive list of Items and Outcomes approved by the Water Quality Task and Finish Group and the Steering Board members. The document was developed in collaboration with both the Steering Board and Water Quality Task and Finish Group through a number of workshops carried out over the summer months.

Next Steps

Following the release of the Water Standard to industry the development of advice and guidance manuals to provide consistency of approaches to nutrient management across Wales, including an understanding of the climatic, and farming types needs to be undertaken. This work includes developing the tools available for farmers to easily undertake a farm assessment, and evidence behaviors / outcomes to illustrate their investment in water quality.

The work completed so far has focused on the development of the **Water Standard** and industries appetite to deliver this across Wales.

How to - What is the Water Standard and Why?

Why is consistent focusing on good management practices for water quality important?

By providing a defined list of good management practices, it helps provide guidance of what should be done on farm. This enables farmers to identify areas to focus on, standards to aim for and what management decisions to consider.

Implementing good management practices on your farm will reduce your environmental and business risk and result in a more sustainable farm and healthier environment. Farming has expressed a desire to evidence good farming practices showing consumers and communities that they farm in an environmentally responsible manner.

What are good management practices in this guide?

These are practices which help manage your farm nutrient resources while minimising your environmental risk. The focus of the practices is on water quality (nitrogen, phosphorus, and sediment).

What do I do if the good management items does not relate to my farm?

Focus on all good management items that apply to your farm. If, for example, you do not generate slurry or do cropping those areas are obviously not applicable. Other areas such as Nutrient management planning, soil health and environmental benefits apply to all.

What do I have to do?

Using the 5 Step plan can help you develop your own understanding of risks, and opportunities relevant to your own business.

1. Understand each good management item which relates to your farm business.

2. Assess what you are currently doing and how it compares to the good management outcomes listed.

3. Identify and plan what you need to do to minimise risk using the outcomes listed.

4. Determine what evidence you currently have for each of the relevant items listed and the risks that produce to nutrient losses from your farm.

5. Gather additional evidence you may need to illustrate your current management practices and what aspirations you might have to manage / improve your nutrient management practices.

Key

Item
Comprehensive list of farm activities collated from existing regulations, advice and guidance and design guides created by the agricultural industry and regulatory bodies across the UK and internationally. These activities all have the potential to impact on surface and ground water quality within the farm boundaries and further afield.

The items listed includes activities from all sectors so may not apply to every farm business. It is the responsibility of the farmer alone, or with the support of an operator to select which activities relate to them and identify how they might like to manage them accordingly from the **Outcomes** section of the Water Standard.

Outcome
A list of actions for farmers to choose appropriate methods to address the risks / opportunities identified within the Items section of the Water Standard. The aim of this is to allow the farmer to select outcomes they feel best fit their farm and the benefits they are looking to achieve.

Benefits
Within the following tables a series of benefits have been identified to develop an indication of the values each individual Item / Outcome delivers in social, environmental and economic terms.

Improves water quality; Outcome provides a benefit to local ground and/or surface waterways, improving biodiversity and reducing potential point source and diffuse pollution sources accessing nearby waterways.

Reduces pollution risk; Outcome provides a benefit to water quality by mitigating the risk of pollution.

Reduces slurry volume; Outcome removes rainfall / surface water flows accessing nutrient storage areas, so reducing slurry volume.

Animal health; Outcome improves land and water quality to provide healthy water for livestock to access for drinking, improving health and resilience within a farmed environment.

Flood risk management; Outcome manages water volumes and sediment loss within a catchment to reduce the risk of flooding down stream.

Climate change resilience; Outcome provides benefits to the environment and water quality through reducing nutrient losses, and improving carbon sequestration / other environmental benefits.

Save money; Outcome provides business benefits by providing farm efficiencies, reducing storage requirements and improving efficiencies within your farming system by reducing risks to nutrient losses, environment, animal health, so increasing resilience to challenging climatic conditions and regulation.

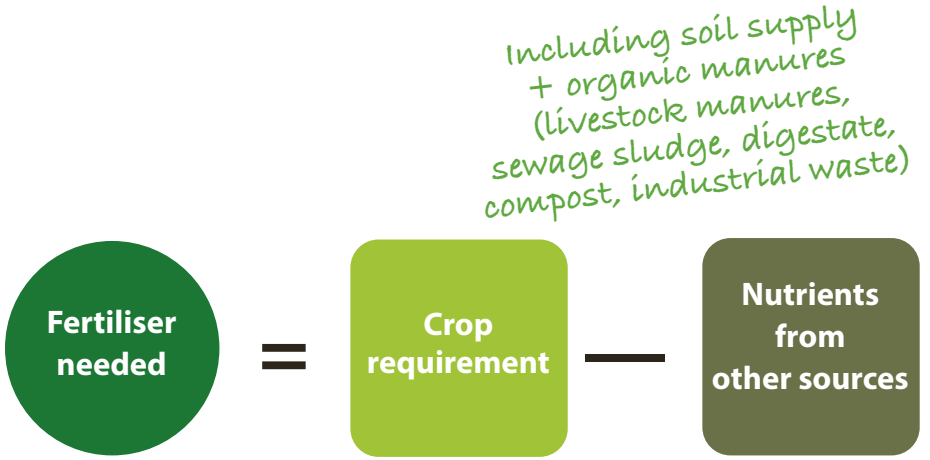
Nutrient management

IN THIS SECTION:

- Nutrient and manure management planning
- Manure and slurry storage
- Maintenance
- During silage making
- Protection of ground water
- Stand off pads – for out-wintering cattle
- Nutrient transfer
- Farm activity log
- Farmyards
- Soil testing
- Livestock manure storage

Nutrient management

What is:



Good nutrient management is one of the keys to farm profitability. Broadly, applying nutrients at recommended rates doubles the yield of most crops. Getting things wrong risks;

- Yields
- Profits
- The environment
- Compliance with regulations

Having a good understanding of where nutrients are coming from and going to on your farm means you will be able to make better decisions around your nutrient needs and where you are accessing them from. This will ensure that you get the best possible response and return on investment, and will minimise the risk of losses to water.

After investing significant time and money into managing your nutrients and making the best decisions about storage, what to apply, when and where, it is important to consider the 'how' in application. Nutrient planning should consider how to avoid the over-application of nutrients to reduce the risk of leaching or runoff, wasting money and in some cases breaching rules. Nitrogen and phosphorus losses to waterways can cause undesirable plant or algal growth. This impacts our rivers habitat value and its ability to host a thriving aquatic community.

Benefits:

- Nutrient budgeting will help you to make best use of nutrients across the farm by identifying the nutrient value in your farm slurry and manures
- Helps save you money and reduce point source and diffuse pollution risks by reducing field losses of excess nutrients to the environment
- Soil testing every three to five years enables you to better plan nutrient applications and improve soil health.
- Potential cost savings when all nutrient inputs are accounted for
- Improved crop and livestock performance from a balanced supply of nutrients

Useful links:

Nutrient management:

- http://www.nutrientmanagement.org/assets/12029
- http://www.nutrientmanagement.org/2-nutrient-management-plan/
- Slurry sampling: https://media.ahdb.org.uk/media/Default/Imported%20Publication%20Docs/RB209%20Organic%20materials.pdf

Soils:

- Think Soils guidance document http://adlib.everysite.co.uk/resources/000/263/234/quickguide.pdf

1.0 Nutrients			Benefits						
No.	**Item**	**Outcome**							
1.1	**Nutrient and Manure Management Planning (NMP):** If you have already produced a nutrient management plan you may wish to check it is clearly set out and includes the steps in this chapter. The "Tried and Tested" plan is an example of a NMP that will meet all the advice and criteria set out below. See Tried and Tested Nutrient management Plan guide for advice: http://www.nutrientmanagement.org/2-nutrient-management-plan/	1. Undertaking soil analysis every three to five years depending on the cropping system. (See Sec.1.10 for more information) pH, P, K, Trace elements	●	●				●	●
		2. Undertaking an **'active'** NMP by adjusting inputs of lime and phosphate, potash, nutrients, creating a 'fit for purpose, optimum soil chemistry and evidencing on field record sheets / programme.	●	●					●
		3. Assess the nutrient requirement of the crop using a recognised fertilizer recommendation system.	●	●					●
		4. Assess the nutrient supply from organic manure. This can be done through a number of methods including RB209. An example of this is found at the following link. https://media.ahdb.org.uk/media/Default/Imported%20Publication%20Docs/RB209%20Organic%20materials.pdf	●	●					●
		5. Undertake a fertiliser nutrient needs calculation by deduct ing the contribution from organic manures from the crop nutrient requirement. This should be evidenced within your NMP.	●	●					●

Undertake and maintain accurate field records of all cropping and applications of fertilisers, livestock manures and organic manures annually. Update the plan at the start of each cropping year. This information will help inform future decisions on nutrient management and demonstrate

Soil pH is considered a master variable in soils as it affects many chemical processes. It specifically affects plant nutrient availability by controlling the chemical forms of the different nutrients and influencing the chemical reactions they undergo. The optimum pH range for most plants is between 6.4 to 7.

1.0 Nutrients			Benefits						
No.	Item	Outcome							
1.2	**Spreading nutrients to land.** When applying nutrients to land farmers are utilising natural fertilisers which act as a replacement for purchasing bagged fertiliser. They also contain 'slow release' organic nutrients which break down in the soil over several growing seasons, giving an on-going supply of nutrients to future crops. Materials spread on agricultural land include: • manures and slurries from the farm or imported from other farms • biosolids (sewage sludge) from sewage treatment works • products from waste treatment processes such as composts and digestates Livestock manures are valuable sources of nutrients and organic matter. Correct application of manures will reduce your fertiliser costs, improve soil structure, and reduce the risk of causing pollution. If you use contractors – ensure they are aware of pollution risks on your farm and that they use safe application rates.	When applying nutrients to land you should follow the advice and guidance set out in the Code of Good Agricultural Practice (CoGAP). You should ensure you, and your contractor have undertaken the following; 1. Used your manure management plan together with a field inspection to identify whether it is safe to spread livestock manures and dirty water – and avoid causing water pollution. 2. Use both your manure and nutrient management plans to work out an application rate. 3. Applying nutrients at a time when crops require nutrients to grow 4. Assessed weather conditions. You should not apply livestock manures and dirty water when: • the soil is waterlogged • the soil is frozen hard • the field is snow covered • the soil is cracked down to field drains or backfill • the field has been pipe or mole drained or subsoiled over drains in the last 12 month • heavy rain is forecast within the next 48 hours. 5. Inspected your fields to consider: • Ground cover – will this increase or decrease the risk of diffuse pollution / leaching • soil conditions – is your field saturated? Check if land drains are running, and if ponding is occurring on the surface prior to applying nutrients. If this is the case it increases the risk of nutrient loss. • Proximity to land drains and watercourses which could leach nutrients into surrounding streams and rivers	●	●	●	●		●	●
			●	●		●		●	●
			●	●				●	●
			●	●				●	●
			●	●				●	●

1.0 Nutrients			Benefits						
No.	Item	Outcome							
		6. Use an appropriate spreading method which reduces the risk of ammonia and nitrate losses to air and water such as band spreaders or injectors for slurry application or broadcast equipment with a low trajectory and large droplets.	●	●				●	●
		7. On bare land and stubble, to reduce odour, ammonia loss and run-off risk incorporate manures within a time period where weather will not create a risk of run off / nutrient losses to air / water. If applying solid manure, you should incorporate it as soon as possible.	●	●				●	●
		8. Check that all equipment is in good working order and calibrated to give a known application rate and uniform spread pattern. If you use contractors, make sure they are aware of all pollution risks and safe application rates	●	●		●		●	●
		9. Considered the method and timing of livestock manure and dirty water applications to land to reduce the risk of micro-organisms affecting animal health by remaining on herbage or in the soil				●		●	
		10. Complied with CoGAP Restrictions on application of nutrients in certain areas by not apply livestock manures and dirty water: • within 10 metres of any ditch, pond or surface water • within 50 metres of any spring, well, borehole or reservoir that supplies water for human consumption or for farm dairies • on very steep slopes where run-off is a high risk throughout the year • on any areas where you are not allowed to because of specific management agreements.	●	●		●		●	●

1.0 Nutrients			Benefits						
No.	Item	Outcome							
With challenging weather conditions ensure you are planning ahead, assess your slurry storage availability and the impact rain could have on this by using the long range weather forecast. If you are concerned ensure you talk to someone about how you might reduce the risk of pollution by contacting your local NRW officer. **Note. A manure management plan includes mapping your fields to identify where spreading restrictions apply by highlighting areas where:** **Red - manures should never be spread** - within 10 metres of a watercourse (including ditches) and within 50 metres of a spring, well or borehole **Orange - Avoided: because there is a risk of water pollution -** land which slopes steeply or drains towards channels (such as tracks or highways) leading to land drains or watercourses and areas with particular environmental sensitivities, for example Sites of Special Scientific Interest (SSSIs) or where there is shallow sandy soil or soil compaction **Yellow - You can spread some manure / slurry with care** as it creates the least risk of run-off/ drainage and pollution through surface water runoff and leaching through drains and ditches. **Green – Low risk land** which may be possible to spread throughout the year									
1.3	**Manure and slurry storage:** Slurry and manure from both housed and outdoor livestock can make a significant contribution to the nutrient status of your land. By ensuring nutrients are stored in well sited locations away from any water courses you can ensure you can preserve nutrient value whilst also reducing the potential of pollution. You are required to have an adequately sized store for organic manures produced on site, to ensure you have capacity to store nutrients safely. By having appropriate capacity for organic manures you can ensure they are spread during appropriate weather, soil and cropping conditions to meet your cropping requirements. Advice and guidance on sizing your storage needs is provided through various technical experts. This includes; • Farming Connect • AHDB – Slurry Wizard	Ensure the location of your nutrient storage, such as temporary field heaps and temporary mobile tank stores does not pose a risk to water quality. Check it is not;							
		1. Within 10 metres of any – river, stream, ditch, perforated land drains, pond or lake (to be measured from the top of the bank)	●	●		●			●
		2. Close to a wetland, Transitional water or coastal water as measured from the shoreline	●	●		●			●

1.0 Nutrients			Benefits						
No.	Item	Outcome							
		3. Opening into any surface water drainage system	●	●		●			●
		4. Within 50 metres of any –							
		• Spring that supplies water for human consumption;	●	●		●			●
		• Well or borehole that is not capped in such a way as to prevent the ingress of water							
CoGAP advice note: When fertilisers are being stored in a building or container these standards do not apply if storage facilities do not pose a risk of run-off or seepage to sensitive waters. For further advice see: ***CoGAP*** *Note: For further in formation see WG Cross compliance - Food and Feed Law* - https://gov.wales/cross-compliance-food-and-feed-law-smr-4-2014									
1.4	**Maintenance:** Ongoing maintenance of your slurry / manure stores, and any associated assets will ensure you are reducing and maintaining this valuable asset for use on the land rather than losing it to the environment. SSAFO regulations layout the rules for farmers to comply with on all Silage, Slurry, Agricultural Fuel Oils constructed post 1991. **SSAFO regs.**	To reduce the risk of failure;							
		1. Inspect slurry and manure stores regularly from the outside (as much as you can see) for leaks and corrosion – do not go into them, unless it is safe to do so.	●	●				●	●
		2. Check channels, drains, membranes, walls and wall/floor joints. Ensure you carry out repairs well before the winter season, where storage capacity is required.	●	●	●				●
Further information on oil storage in SSAFO can be found under Control of Pollution (Oil Storage) (Wales) Regulations 2016: https://naturalresources.wales/media/681287/osr-wales-faq-rt-pc-final-draft-v2-01022017.pdf **Note:** It is a legal requirement to inform NRW 14 days prior to use of any new store.									

1.0 Nutrients			Benefits						
No.	Item	Outcome							
1.5	**Silage making:** The generation of effluent from silage can impact on the environment. Even small amounts of silage effluent from crops in an enclosed pit or silo, or from baled silage, will kill fish and other water life for a long way downstream if it gets into surface waters. (See note below for further info.)	1. Check around the silo and effluent tank for leaks and blockages daily and ensure you put right any problems immediately	●	●					●
		2. Check effluent tank levels frequently and empty as necessary.	●	●					●
		3. Check ditches, surface waters and clean water drains for signs of pollution. If any are found, put your accident and emergency plan into action.	●	●					●
		4. Ensure you manage effluent safely by diluting to an appropriate concerntration to mitigate risks prior to being applied as a fertiliser. Apply according to other nutrient application guidance notes set out in Chapter 1. 1.2	●	●					●
1.6	**Protection of Groundwater:** Groundwater is the water held underground in rock formations. Where these formations support wells, boreholes, watercourses, wetland habitats etc, they are called aquifers. Aquifers are susceptible to leaching from an over application of nitrogen to crops / grassland areas. Where aquifers provide water for abstraction purposes, water quality is monitored by	Make sure you do not allow yard contaminants, even minor spillages of substances such as oils or chemicals to soak away. Manage materials such as silage effluent, slurry and yard washings so that they do not soak away to groundwater. The underlying soils and rock types affect porosity of your ground. Check for free draining soils where groundwater is at risk of being contaminated by fast draining soils. This reduces the time available for plant uptake by your crops.	●	●	●			●	●
1.7	**Stand off pads** - for out-wintering cattle	1. Ensure good design, construction and management are in place to avoid polluting groundwater and surface water - provide a liner and effluent collection facilities within the design to reduce runoff risk and ponding of effluent leaching into the surrounding ground in a concentrated way.	●	●	●	●		●	●

Note: Seek advice from Natural Resources Wales;

- About suitable sites to ensure you don't affect ground or surface waters nearby.
- If you intend to construct a new silo or substantially enlarge or reconstruct an existing silo.

To meet with the SSAFO regs. for any new store / silos The requirements include having; impermeable floor and walls (they must not leak), being corrosion resistant, the base must extend beyond the walls and have channels on all sides to collect effluent, it must have an effluent tank of appropriate size, and no part may be within 10 metres of any field drains or surface waters. Effluent tanks must have a design life of 20 years without maintenance.

1.0 Nutrients			Benefits						
No.	**Item**	**Outcome**							
1.8	**Nutrient transfer:** All reasonable steps are taken to ensure that the transfer of any liquid fertilisersand organic manures (this includes: biosolids, digestate, waste being recovered to land, chicken litter, pig / cattle slurry and farm yard manure) is undertaken where there is no risk to the surrounding surface and ground waters.	1. Undertake a risk assessment of nutrient transfer processes and the typical equipment being used by the farmer / contractor to do this on your farm. – Are you close too, or above slopes which could runoff into a watercourse?	●	●				●	●
		2. Develop a risk plan / map, accident management plan to inform any contractors/ operators of the plans content and location prior to nutrient spreading / transfer activities being undertaken. Make sure the plan, and spill kits are accessible in case spillages occur.	●	●				●	●
In the event of a spillage it is best to inform the NRW and record the actions taken to mitigate any risks – such as acting out your pollution risk plan. This evidence should be taken into consideration by the regulator on receiving information that a pollution incident has occurred and if any legal enforcement action is considered. It should be eligible to be presented in the farmers defence if and when required.									
1.9	**Farm activity log:** This provides farms with a recognised way of demonstrating the process of identifying risks to water quality through nutrient losses and the farmers' awareness, and methods to manage nutrients on farm. This improves water quality which in turn provides social, environmental and economic benefits to the farm and surrounding community. You may be keeping an activity diary for farm assurance / other purposes.	**Consider:** 1. Using a farm Plan to evidence risks and opportunities on farm. This captures your methods to reduce the risk of nutrients accessing ground and surface waters through items in the Water Standard.	●	●	●	●		●	●
		2. Develop and maintain an 'Active' Nutrient Management Plan to evidence decision making and use of nutrients on farm. (Example: http://www.nutrientmanagement.org/2-nutrient-management-plan/)	●	●	●	●		●	●

1.0 Nutrients			Benefits						
No.	Item	Outcome							
1.10	**Slurry sampling and other organic manures:** Analysis of your slurry can help identify true nutrient values, and provide guidance on how to apply responsibly. If you are importing waste / bio-solids onto farm for spreading ensure the supplier provides appropriate analysis results to input into your nutrient management plan.	When developing your nutrient management plan consider using the following techniques to sample the nutrient value of your slurry : 1. **Lab sampling:** Identify the nutrient content of your slurry by undertaking a slurry sampling using a laboratory test to identify nutrient values. This should be done after the lagoon has been mixed thoroughly, and only necessary when large volumes have been inputted or removed from the lagoon, or long periods of heavy rainfall affected dilution. Generally laboratory analyses should include: dry matter (DM), total N, P, K, S and Mg, and ammonium-N (readily crop available N). Additionally, for well composted FYM nitrate-N should be measured and for poultry manures uric acid-N. 2. **Home sampling:** Identify the nutrient content of your slurry by undertaking slurry sampling using a hydrometer to identify nutrient values. This should be done after the lagoon has been mixed thoroughly, and only necessary when large volumes have been inputted or removed from the lagoon, or long periods of heavy rainfall affected dilution. 3. **Guidance:** Identify the nutrient content of your slurry by reviewing the advice and guidance provided in RB209 on nutrient content of different manures. https://media.ahdb.org.uk/media/Default/Imported%20Publication%20Docs/RB209%20Organic%20materials.pdf provides approximates of nutrient value for your information. 4. **Contractor:** Identify the nutrient content of your slurry by requesting a sample to be taken by your contractor prior to spreading. This can be done using a calibrated system built into their slurry spreading equipment	● ● ●	● ● ●				● ● ●	● ● ●
For further information see; http://www.nutrientmanagement.org/assets/12029. This is a practical guide to help you get started. It should be used alongside a more complete guide to nutrient management such as Tried & Tested and The Fertiliser Manual (RB209), soil management advice such as Think Soils, and more detailed guidance on regulations such as Nitrate Vulnerable Zones (NVZs) and Silage, Slurry and Agricultural Fuel Oil regulations (SSAFO) (relating to standards for manure storage)									

1.0 Nutrients			Benefits						
No.	**Item**	**Outcome**							
1.11	**Farm yards**	**See** Chapter 4 **Farm yard infrastructure for more information**							
1.12	**Soil Testing:** Before applying anything to the land, it is important to know what's in the soil by conducting a soil analysis. This should be undertaken every three to five years. The pH controls the chemistry of the other nutrients in the soil.	To maximise efficiencies, and minimise environmental impacts; 1. Conduct soil analysis of your fields to understand nutrient uptake and availability / requirements for the cropping required. This should be undertaken every three to five years (depending on nutrient inputs, liming and cropping patterns). Basic soil sampling should include: P,K,pH,and magnesium. To maximise the benefits of understanding your soils consider including sulphur, organic matter and clarifying the soil type to better understand what controls the chemistry of the other nutrients in the soil.	●	●	●	●		●	●
See the 'Think Soils' manual for advice and guidance on good soil management practices and health indicators of specific soils. Think Soils guidance document *http://adlib.everysite.co.uk/resources/000/263/234/quickguide.pdf*									
1.13	**Livestock manure storage:** Livestock manures and dirty water can cause serious water pollution if they get into surface water or groundwater. Storage systems that are appropriately sized, well built and maintained will reduce these risks.	1. Check your Solid manure store has solid bases which slope so that liquids run-off into collection channels. 2. Include collection channels outside the store if the walls let liquids pass through them. 3. Consider roofing over your manure store to keep rainfall off the manure and minimise the volume of liquids produced. *Note: You can reduce odour and ammonia emissions from poultry manure by keeping it as dry as possible.* 4. Ensure any leachate / effluent is collected in a suitably sized tank, or directed to a slurry store.	● ● ● ● ●	● ● ●	● ●			● ●	● ●
Note: A 2200 gallon tanker of typical (6% dry matter) cattle slurry provides the 'bagged' equivalent of: 12kg of Nitrogen, 6kg of Phosphate and 29kg of Potash. Each hectare (2.5 acres) would get 60kg N, 30kg P and 145kg K from a 50 m3 (11,000 gallon - or 5 tanker) application. (Think manures)									

Available and organic nutrients and their impacts

How much to spread?

Manures contain readily-available nutrients that can be used as a replacement for bagged fertiliser. They also contain 'slow-releasing' organic nutrients which will break down in the soil over several growing seasons to give an on-going supply of nutrients to future crops.

In general, 50 to 60 per cent of the total phosphate and 90 per cent of the total potash in manures is readily available. Phosphate and potash percentages do not vary by time of year or soil type. Readily available N is more easily leached from the soil when manure is spread in the autumn/winter, and can be lost to the atmosphere as ammonia gas or nitrous oxide. Readily-available nitrogen is highest in slurries and poultry manure. The amount of nitrogen lost depends on when, where and how you spread (see following chapters).

Some typical values for different types of manure are given in the table below. Crop available nutrients values are based on spreading in late winter/spring (values for spreading at other times are available from Defra's *Fertiliser Manual* RB209 or you **must** use the values in Defra NVZ Guidance if you are in a NVZ).

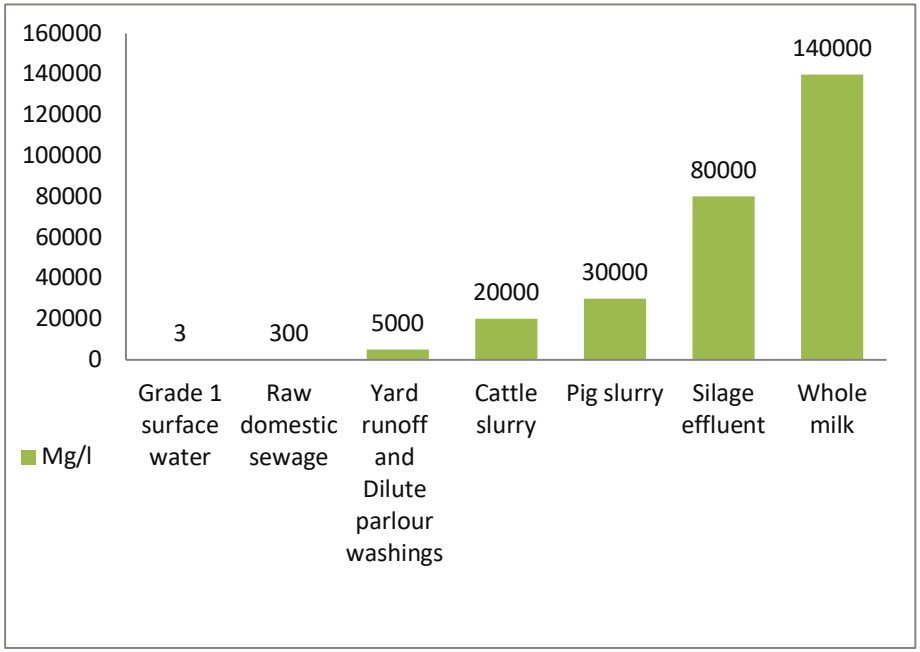
	Total nutrients			**Crop available nutrients**		
Type of manure and dry matter (DM) content (%)	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)
			kg/m³			
Cattle slurry (2%)	1.6	0.6	2.4	0.9	0.3	2.2
Cattle slurry (6%)	2.6	1.2	3.2	1.2	0.6	2.9
Cattle slurry (10%)	3.6	1.8	4.0	1.3	0.9	3.6
Pig slurry (2%)	3.0	1.0	2.0	2.2	0.5	1.8
Pig slurry (4%)	3.6	1.8	2.4	2.5	0.9	2.2
Pig slurry (6%)	4.4	2.6	2.8	2.8	1.3	2.5
Typical dirty water	0.5	0.1	1.0	0.3	0.05	1.0
			kg/tonne			
Cattle FYM (25%)	6.0	3.2	8.0	0.6 (old) 1.2 (fresh)	1.9	7.2
Pig FYM (25%)	7.0	6.0	8.0	1.0 (old) 1.8 (fresh)	3.6	7.2
Layer manure (35%)	19	14	9.5	9.5	8.4	8.6
Broiler litter (60%)	30	25	18	10.5	15.0	16.2

To convert kg/m³ to units/1000gallons, multiply by nine. To convert kg/tonne to units/ton, multiply by two.

Source: Think Manures - http://www.nutrientmanagement.org/assets/1202

Agricultural nutrient values (BOD)

Losses from nutrients applications can have a detrimental effect on the water quality of nearby streams, rivers and lakes. This is measured using a measure of the Biological Oxygen Demand (BOD) is a measure (in milligrams of oxygen/litre of water) of this. It is used to show the polluting strength of livestock manures and other materials. A Grade 1 surface water normally has a BOD of less than 3mg/l, any loading in excess of this can be considered a pollutant.



BOD values of Agricultural nutrients

Farm yard infrastructure

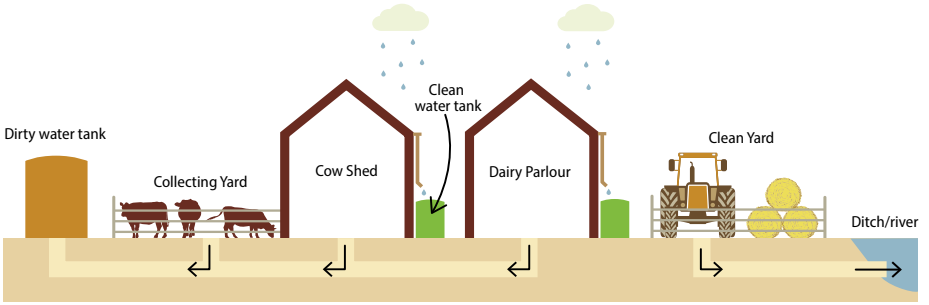
IN THIS SECTION:

- Yard runoff
- Water quality
- Spills
- Standoff pads for out wintering cattle

Farm yard infrastructure

What is:

Seperating clean and dirty water



Note: if not brushed/scraped regularly, collecting yard and cow shed may produce slurry rather than dirty water

Source: Tried and Tested – Think Manures. http://ngagecms.nfuonline.com/assets/97994)

Nutrient management within the farm yard is made easier by establishing ways to create a well-managed farmyard, you can then minimise potential problems and avoid wasting valuable nutrients through losses to the surrounding landscape.

You can reduce pollution risk significantly by separating clean and lightly fouled water. By identifying areas where dirty water is created you can use a yard drainage and building layout plan to tackle them one by one. By listing the items and the risks they pose you can highlight the most cost-effective improvements first.

By maintaining gutters, downpipes and drains you will reduce dirty water immediately. Repairing leaks, dripping taps and overflowing water troughs around the farmyard will also help reduce water loss and dirty water volumes generated within the yard.

By reviewing your yard use you can identify separate clean and dirty yard areas. This will ease the burden on your slurry storage facilities and reduce the volume of slurry to be spread. Assess the costs and benefits of putting a cover on your slurry store or lagoon to reduce spreading costs and increase your storage capacity.

Benefits:

- Save time and money when handling nutrients
- Reduced nutrient spreading costs and risk
- Small spills mopped up before they become a problem
- Increased value of nutrients and manures
- Reduce pollution risk
- Improve animal health and water quality by reducing the risk of faecal matter and disease entering water supplies

Useful links:

- **CoGAP:** https://gov.wales/sites/default/files/publications/2018-02/code-of-good-agricultural-practice-introduction.pdf
- **SAFFO:** https://gov.wales/sites/default/files/publications/2018-02/code-of-good-agricultural-practice-introduction.pdf

2.0 Farm Yard Infrastructure			Benefits						
No.	Item	Outcome							
2.1	**Yard Runoff:** You can reduce slurry volume, so reducing pollution risk signifigantly by separating clean and lightly fouled water. Identify areas where lightly fouled water is created and tackle them one by one, starting with the most cost effective improvements first. **Clean Water -** Rainfall run-off from roofs and clean yards not soiled by dung or urine. Also rainfall from covered silage clamps if it is not contaminated with effluent. **Lightly fouled water -** Lightly-contaminated runoff from lightly-fouled concrete yards or from the dairy/parlour that is collected separately from slurry. Slurry and lightly fouled water water have a high readily available nitrogen content,. however, compared with slurry, lightly fouled water has a low total nitrogen content that limits its impact on nitrate leaching. This means it can be applied to land during the closed periods – provided it is managed and spread safely, so that it does not enter surface water. **Slurry -** is **defined** in the **SSAFO** regulations as liquid or semi-liquid matter composed of excreta produced by livestock while in a yard or building. Slurry includes parlour and yard washings, and any contaminated rainfall.	1. Identify foul-water and clean-water drainage paths and record in the emergency plan. *Colour-coding the manhole covers to show foul-water and clean-water drainage paths can make risk management easier in the yard, and prevent leaks and spillages reaching the wrong system and causing a pollution.* 2. Identify and repair gutters, downpipes and drains, leaking taps and pipes within the farm yard area. Lightly fouled water can be directed to a **Swale, Sediment Trap, Pond / Wetland, Soakaway**, or **Rainwater Harvesting** to reduce the speed and volume of water adding to your slurry. This can also improve water quality before water enters the watercourse. (See Chapter 3 for information on Rural Sustainable Drainage Systems). 3. Prevent lightly fouled yard runoff from entering soakaways, blind ditches and watercourses without the ability to filter and / or hold back flow to improve water quality. (See Chapter 3 for information on Rural Sustainable Drainage Systems). 4. Consider roofing over open collecting yards, feeding/loafing areas and muck storage to reduce generation of rain fed slurry. *Runoff with a low to moderate level of pollution primarily caused by dust from dry yards and air borne particles can be discharged into a Swale, Sediment Trap or Pond / Wetland. This improves water quality, and reduces sediment losses to water courses.* 5. Consider rainwater harvesting from roof areas to use on the farm. Management of water quality through sampling / filtration will provide additional benefits to livestock health and usage opportunities for rain water harvested on site.	●	●	●	●	●	●	●
			●	●	●	●	●	●	●
			●	●	●	●		●	
			●	●	●	●		●	●
			●	●	●	●		●	●

2.0 Farm Yard Infrastructure			Benefits						
No.	Item	Outcome							
		Long term this provides resilience to drought and water shortages and can help save money. Ensure you check the water quality within your tank as roof sediment can cause high nitrate and bacteria levels in the stored water supply.							
CLEAN WATER from roofs or clean yards can be collected in large volumes and stored for use on the farm. This should not be mixed in with dirty water or slurry, but diverted directly to a drain or ditch. **DIRTY WATER** can cause pollution if it enters any surface water / ground water sources. You should ensure you have enough storage to be able to spread it in the right soil and weather conditions.									
2.2.	**Water Quality:** *Through understanding where nutrient losses might occur within your farm yard, simple measures can be taken to reduce the risk of them accessing your water supply.* You can reduce risk by draining off into separate gullies any areas used for risky operations, such as refuelling or washing machinery. You can then quickly isolate the gullies from the wider drainage system if a pollution incident occurs. Dirty yards must not drain directly into watercourses.	1. Consider a constructed holding pond (e.g. attenuation balancing pond) or ditch near outfalls to slow down the flow of water from unpolluted hard surfaces into water courses and improve water quality. *Note: This also provides a buffer to mitigate the risk of a pollution incident reaching open water / ground water sources. Do not use existing natural ponds which can have impacts to water quality and biodiversity.*	●	●	●	●	●	●	●
		2. Provide a bunded waste store for separated plastics, string, wrap and other materials which risk causing pollution to water courses. *It is best to separate at source and store different materials separately for ease of disposal.*	●	●	●	●		●	●
		3. Consider a cover over slurry stores and lagoons to reduce the volume of rainfall adding to your storage requirements for slurry. *This could be done using a floating cover or roof dependant on suitability.*	●	●	●	●		●	●
		4. Undertake a hard standing and yard area assessment to identify any ingress issues which could cause ground water contamination.	●	●	●	●		●	●

2.0 Farm Yard Infrastructure			Benefits						
No.	**Item**	**Outcome**							
Note: This is perhaps the most important step in slurry management. *When assessing your farm yard infrastructure ensure you aim for enough slurry storage to give you control over when and where to spread to maximise the fertiliser value of your slurry and to avoid water pollution. By allowing for at least four months without spreading, and keeping excess water away from your manures you can ensure weather conditions do not generate nutrient wastage by applying in unsuitable conditions. Current regulations state farms require a minimum of 4 months slurry storage to ensure manure management is feasible with adverse weather conditions affecting your ability to spread in suitable weather conditions and growing conditions.*									
2.3	**Spills:** Emergency plans to deal with spillages of fuel, fertiliser or pesticides are an essential part of the well-managed farm. Would you know what to do in the event of an emergency? Would anyone else, if you weren't around?	1. Create an emergency plan for spills to mitigate risk. See Chapter 7 – Environmental Accident and Emergency Plan for more details. 2. Provide a spill kit of sand or cat litter handy to manage spill risks if they occur.	●	●					
		Note: Absorbent materials such as saw dust, straw, and cat litter can be used to mop up spills, but this should be disposed of correctly to ensure the pollution risk isn't moved elsewhere.	●	●					
2.4	**Stand off** pads - for out-wintering cattle. Over-wintering cattle outside on a well-designed and managed woodchip pad offers many benefits including improved animal health and welfare; less damage to pasture from treading, reduced labour costs, and a cheaper alternative to constructing traditional buildings.	1. Ensure good design, construction and management are in place to avoid polluting groundwater and surface water - provide a liner and effluent collection facilities. Seek advice from Natural Resources Wales about needs for planning and suitable sites to locate wood chip corrals. Consider: • Sustainable out-wintering of livestock • Design and construction • Stocking rates and space allowance • Animal health and welfare • Minimising environmental risks • Management of soiled woodchip bedding from Out Wintering Pads	●	●	●	●		●	●
Note: Woodchip pads have the potential to impact on water quality, in particular on groundwater. Research in the last decade has clearly shown the vulnerability of ground- and surface water to pollution from unlined pads, and the need for robust lined systems with effluent collection. AHDB have developed a design guide to help inform you on siting, planning, design requirements and costs. AHDB woodchip pads design guide									

Surface water drainage / farm tracks & Gateways

IN THIS SECTION:

- Rural sustainable drainage systems
- Farm tracks and gateways
- Wetlands
- Constructed farm wetlands

Surface water drainage

What is :

Surface water drains make up the water supply and accessibility to land for the majority of farms across Wales. With high rainfall and changing climates, how we manage our surface waters; Rivers, streams, ditches, ponds and lakes affects our ability to access land, supply livestock and pastures with a water supply, and protect the environment from the risk of pollution from farming practices. Where surface waters capture sediment and nutrients the use of natural and man-made drainage systems can help to reduce risks, and provide enhancements such as carbon sequestration, biodiversity, habitat, and filtration.

Well-maintained ditches provide improved drainage and access to land. They can also soak up nutrients, control the flow of water to rivers, filter out soil particles and allow water to infiltrate into groundwater reserves.

These systems can also carry risks if not maintained correctly, moving water away too quickly, without treatment, rapidly transferring pollutants and large volumes of water to streams, rivers, lakes and estuaries.

As the focus on water increases, and its value becomes more widely recognised techniques such as Natural Flood Management and Rural Sustainable Drainage Systems (SuDS) are becoming more widespread.

These can create many opportunities for improving the management of water at source within your farm, utilising existing wet areas and more challenging field parcels. Rural SuDS can be made up of manmade and natural features used to mimic natural processes. They manage the risk of pollution by intercepting surface water runoff and trapping soil before it leaves the field. A further benefit is their ability to temporarily capture water and slow down flow. This can reduce localised flooding and drought risk and provide valuable aquatic habitats in the form of micro-wetlands for farmland wildlife and will encourage the downward movement of water to recharge aquifers.

Benefits:

- Reduced loss of sediment and potential pollutants from the farm
- Improved stock health and reduced vet bills through dry tracks
- Early pollution warning through capturing pollution risks
- Improved biodiversity
- Protection of water resources for drought and flood risk
- Reduce Flood and Drought risk
- Combat climate change
- Provide amenity value
- Ground water recharge by slowing the flow

Farm tracks and gateways

What is :

Farm tracks and gateways provide access to your land, increasing your ability to farm in all weathers, however they also pose a risk, channelling rainwater in wet conditions and cause runoff problems. Solid tracks and gateways provide a way to manage erosion and runoff, so improving animal health and reducing pollution risks. Using drainage to divert runoff from tracks into vegetated field margins or swales means pollution risks can be reduced, intercepting and filtering sediments and nutrients out before they reach the watercourses. Simple measures such as grading tracks with a camber towards the field / cross drains allow water to be drained into the surrounding fields preventing water and soil finding its way into streams and rivers or onto the public highway.
When considering ways to improve access by using tracks you should do the following;

- Create well-drained tracks with appropriate surfaces
- Position tracks to suit potential uses
- Provide good drainage
- Avoid routes with steep slopes that lead to un-vegetated land, roads or watercourses
- Site gates at the top of sloping fields where possible

Benefits:

- Reduced loss of sediment and potential pollutants from the farm
- Improved stock health and reduced vet bills through dry tracks
- Early pollution warning through capturing pollution risks
- Improved biodiversity
- Protection of water resources for drought and flood risk
- Reduce Flood and Drought risk
- Combat climate change
- Provide amenity value
- Ground water recharge by slowing the flow

Useful links:

AHDB – Drainage:

- https://ahdb.org.uk/knowledge-library/field-drainage-guide

Pinpoint Infrastructure guides:

- Infrastructure Management Introduction
- Farm Access
- Stream crossings

Rural SuDS:

- SEPA Rural SuDS Guide
- SEPA Constructed Farm Wetlands Manual

3.0 Surface Water Drainage / Farm tracks & gateways			Benefits						
No.	**Item**	**Outcome**							
3.1	**Rural Sustainable Drainage Systems (SuDS):** Using nature based solutions such as Rural Sustainable Drainage Systems (SuDS) can improve water quality and create habitats whilst managing risk. They reduce agricultural diffuse pollution impacts as they form natural, physical barriers to treat rainfall runoff. SuDS solutions are designed to be low cost, above ground drainage structures that capture soil particles, organic matter, nutrients and pesticides before they enter our water environment. The benefits of a natural system to capture and treat runoff contribute to good environmental practice. By capturing sediment you can return fertile soil back to farmland. This will help your business become more resilient to the impacts of climate change. Trapping soils, organic matter and nutrients means that valuable assets can be reclaimed and reused within your farm, rather than being lost to the rivers and sea.	1. Consider, where appropriate, installing a Swale to slow flow and drop sediment into the channel prior to reaching a watercourse. *This is a dry shallow, vegetated channel that collects, treats and transfers runoff from a farm yard or field to a downstream Rural SuDS. If appropriate you can discharge directly to a watercourse (e.g. roof runoff).* 2. Consider, where appropriate, installing a **sediment trap / sediment trap bund** to capture field runoff and reduce the risk of soil loss into a watercourse or road. *A sediment trap is a dry, vegetated basin that temporarily fills up during a rainfall event and traps sediments and pollutants. A sediment trap / bund helps reduce sediment loading in ponds and wetlands when constructed directly upstream.* 3. Consider installing a **pond** to provide attenuation and storage. This can be used for improving water quality, encourage wildlife, trap excess nutrients and sediment, and provide flood storage and water to manage risks of fire fighting and/ or water source in drought conditions, if fit to drink. *Ponds should be made of a permanent pool of water that stores runoff, with capacity to accept additional flows for long enough to provide high level treatment including nutrient removal before discharge to a watercourse.* 4. Consider **rejuvenating** your **farm pond**. Firstly assess habitat value, water quality and sediment build-up of existing farm ponds to assess their worth in improving water quality, and providing attenuation to ensure farm resilience in drought conditions. Ponds can be used to encourage wildlife, trap excess nutrients and sediment, and provide water for fire fighting.	●	●	●	●	●	●	●

3.0 Surface Water Drainage / Farm tracks & gateways			Benefits						
No.	**Item**	**Outcome**							
		5. Consider where appropriate installing a wetland to manage water quality from slightly soiled runoff. A Constructed Farm Wetland (CFW) operates in a similar manner as ponds but have additional shallow marshy areas. They provide enhanced treatment and wildlife habitat potential. Note: Wetlands and Constructed Farm Wetlands (CFW) have different designs. CFWs collect lightly contaminated runoff from outdoor FYM (Farm Yard Manure) yards all year or outdoor silage clamps in winter months	●	●	●	●	●	●	●
Advice and guidance on installing Rural SuDS / Constructed wetlands can be accessed through advice and guidance available from specialist advisors and international publications. If you would like to develop your proposal contact NRW for advice on guidance on suitability of location, and context to ensure you provide an enhancement, and not increase environmental risks.									
3.2	**Farm tracks and gateways:** Good tracks and well-maintained gateways help farmers get around their farms easily making the most of what every field has to offer. It's important to ensure that tracks and gateways don't become channels for runoff in wet weather. When adding new tracks, careful route planning and positioning, with sound construction and regular maintenance are all important. These will help you prevent erosion of track surfaces, minimise runoff problems and avoid damage to machinery and injury to livestock.	1. To prevent run-off channelling along impervious surfaces consider installing **cross-drains**. *By breaking up flows generated by sloping tracks or roadways erosion risk and sediment runoff can be managed before it becomes an issue.* 2. Consider installing **track drainage** for vehicles and livestock. Sediment risks and rutting can be prevented by incorporating water management into your track design. *Drainage ditches alongside tracks manage risks at source, slow the flow and reduce sediment and pollution risks before they reach a water course.* 3. To capture polluted run-off before it accesses field drains, ditches or surface water consider installing a **sediment trap**. This can include capturing and attenuating road runoff to improve water quality, and reduce sediment loading into streams and rivers whilst improving biodiversity.	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●	● ● ●

3.0 Surface Water Drainage / Farm tracks & gateways			Benefits						
No.	**Item**	**Outcome**							
		This can be diverted into a Rural SuDS system to manage flow, improve water quality and reduce the risk of pollution entering a water course nearby.							
		4. Consider installing a **culvert or bridge** to reduce the impact on water quality where livestock tracks cross surface water. (See CoGAP 4.2.1 Drainage and tracks for further advice on consents).	●	●	●	●	●	●	●
		5. Identify run-off channelled through gateways at the bottom of sloping land. Assess the risk of field runoff impacting on nearby watercourses and identify options to reduce this risk. *Addressing this might include needing to relocate the gateway. This may require planning permission first, so seek advice from your local authority, and / or NRW officer.*	●	●	●	●	●	●	●
Water captured off roads and tracks can be diverted into a Rural SuDS system to manage flow, improve water quality and reduce the risk of pollution entering a water course nearby. By capturing dirty water with a high nutrient load such as dairy track runoff roadside vegetated ditches, or swales can capture sediment, absorb nutrients and slow the flow of water accessing streams and rivers. When relying on Rural SuDS to improve water quality it is important the nutrient concentration, runoff volume, and treatment time is considered within the design of the SuDS System. Weir walls and sediment traps can increase the treatment time and reduce sediment volumes where required.									
3.3	**Wetlands:** Wetlands operate in a similar manner as ponds but have additional shallow marshy areas. They provide enhanced treatment and wildlife habitat potential. Note: A Wetland should be used to collect and treat the rainfall runoff from roofs, clean yards and general yards that contain much lower levels of pollution.	1. Consider how land used to direct water to protect the environment might improve your biodiversity and resilience, as well as reduce your drainage / management costs. *Wetland areas, and peat soils have high carbon sequestration and habitat value. To maintain this value It is important not to affect water levels in these areas by not increasing drainage.*	●	●	●	●	●	●	●
		2. Consider using light grazing to remove scrub from natural wetlands or prevent it from becoming established.	●	●	●	●	●	●	●
		3. Consider creating wetland buffer zones, including wet woodland, along watercourses. This can increase biodiversity and help combat flooding downstream.	●	●	●	●	●	●	●
		4. Seek specialist advice on wetlands from Natural Resources Wales.	●	●	●	●	●	●	●

3.0 Surface Water Drainage / Farm tracks & gateways			Benefits						
No.	**Item**	**Outcome**							
3.4	**A Constructed Farm Wetland (CFW):** A CFW is defined as "one or more shallow, free surface flow constructed cells containing emergent vegetation, which is designed to receive and treat lightly contaminated surface water runoff from farm yards, in such a manner that any discharge from the wetland will not pollute the water environment". CFWs collect lightly contaminated runoff from outdoor FYM (Farm Yard Manure) storage areas and all year or outdoor silage clamps in winter months (see https://www.sepa.org.uk/media/131412/constructed-farm-wetlands-manual.pdf. Part 4 - Steading). **The benefits of Constructed Farm Wetlands are;** • High level of treatment • and robustness • Relative low cost and simplicity of operation • Odour minimisation • Aesthetically pleasing • Habitat and biodiversity enhancement • Contingency measures • Flood attenuation	1. Consider providing a constructed farm wetland to attenuate flows from **Livestock handling areas** where livestock are held occasionally for less than 24 hours. *Areas such as occasional livestock access tracks or where livestock are held for a short period of time can become heavily contaminated. By scraping these areas and collecting and storing the manure the total level of contamination will be reduced allowing any precipitation driven drainage from these areas to be conveyed to the CFW.* 2. To reduce nutrient losses from rainfall runoff consider providing a constructed farm wetland to attenuate flows from **roof drainage** which may receive high levels of dust / particles. *The first flush of roof runoff down gutters may increase the BOD levels of runoff. Where this is the case run-off should be treated through a CFW or stored and spread.* 3. To attenuate flows from **lightly contaminated concrete areas** as a result of vehicle and occasional livestock movements consider capturing runoff and discharge into a CFW. *A short survey of existing farm infrastructures and a map highlight the sources and areas of the waters to be treated and the direction of the flow on the farmyard. The type of drainage to be treated through a CFW must be agreed with NRW prior to any development.* 4. To capture and **attenuate machinery washings** (unless contaminated with pesticides or veterinary medicines) consider attenuating flows in a CFW. *In order to determine the volumes to be treated calculate the areas of yards, tracks and roofs within the farmyard to be drained and the volumes used in yard washings.* 5. Consider capturing winter run–off from **silage pits** and treating within a CFW. **CFWs are not suitable for the treatment of more concentrated effluent types, such as silage effluent, slurry, raw milk or run-off containing veterinary medicines or pesticides.**	●	●	●	●	●	●	●

3.0 Surface Water Drainage / Farm tracks & gateways			Benefits						
No.	Item	Outcome							
		6. Capture runoff from **baled silage storage areas** on farm and direct flows into a CFW. *Specialist advice from a suitably qualified consultant/engineer is advisable when assessing the need for a CFW and the suitability of a CFW site.*	●	●	●	●	●	●	●

Constructed Farm Wetlands (CFWs) addresses the ever more apparent requirement for a holistic approach to land and water management.
Manuals exist which provide information and guidance necessary for the design, siting, construction and maintenance of sustainable constructed farm wetlands used to treat lightly contaminated surface water runoff from farm yards. This chapter has been drafted using Guidance from The Scottish Environment Protection Rural SuDS guide. The guide explains how to look after the systems and promotes the wider benefits such as coping with extreme weather related to climate change, localised flood prevention and enhancing biodiversity.

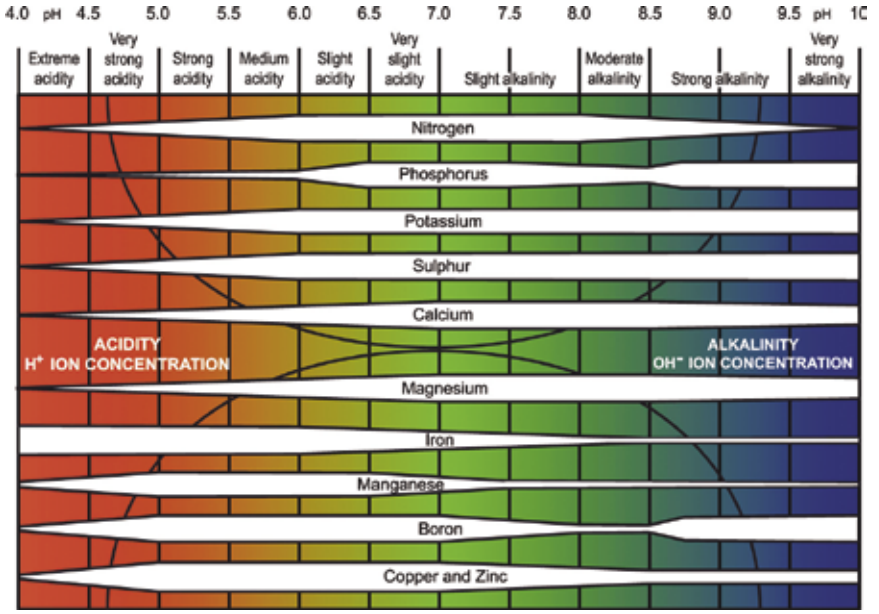
Soils / Cropping / Environment

IN THIS SECTION:

- Know your soils
- Field operations
- Soil Poaching
- Soil Management Plan
- Organic matter
- Cultivations
- Buffers
- Buffer strips

Soils / Cropping / Environment

What is:



Soil is the farmer's biggest agricultural asset. A healthy soil helps ensure the best returns from every kind of farming.

Understanding your soil is the first step to taking action to improving it, for the benefit of your farm productivity and the environment.

While your soil type and its key characteristics do not change, the soil structure will vary across the farm from year to year depending on things such as crop rotation, machinery use, livestock density and the weather.

Know your soil pH and nutrient needs helps you to understand your existing soil nutrient levels and helps you to apply only the additional nutrients you need, saving you time and expense.

Preventing soil compaction protects soil structure and increases air and water supply to roots and the soil flora and fauna. If soil is worked in unsuitable conditions or worked too hard you can damage soil structure. When this occurs, the soil can take years to recover. Bare soils are vulnerable to damage and degradation but vegetation provides a protective covering that helps prevent the loss of seeds, nutrients and organic matter. **Support healthy soil organic matter** by ensuring your soils are provided with plant and animal matter which releases nutrients into the soil as it decomposes. This improves the porosity, workability, fertility and biota of soils, as well as helping to maintain good structure.

Cropping should be managed to ensure it does not pose a risk to the environment. When using high risk crops which leave bare soil, and / or are harvested late such as maize it is possible to Under-sow with ryegrass to protect soils through the winter or use early ripening varieties. Consider your crop location to reduce run off risk and pollution to water courses by harvesting and nutrient applications post harvest.

Environmental enhancements such as planting rough grass strips across slopes reduces runoff and helps to stop soil and nutrient loss. Where it is possible to add a permanent feature, you could plant a hedge that will not only slow down runoff but also protect against wind erosion.

Benefits:

- Reduced risk of soil erosion / losses of nutrients
- Reduced pollution risk to surrounding watercourses
- Less soil damage and better establishment
- Less crop damage
- Optimum plant density

Useful links:

- Search for your soil type using the Soilscapes online tool.
- The Environment Agency's 'Think soils' manual is an in-depth practical guide to soil assessment on your farm.
- CoGAP
- https://meatpromotion.wales/images/resources/e4364_HCC_Soil_Management_ENG_5FINAL.pdf

4.0 Soil / Cropping / Environment			Benefits						
No.	**Item**	**Outcome**							
4.1	**Know your soils:** By preparing a soil management plan you can illustrate what you do to manage fieldwork and livestock management on a field-by-field basis, see section 4.4. for further details.	1. Identify the risks of run-off and erosion when planning what to grow or how to manage livestock on sloping land.	●	●		●	●	●	●
		2. After rain, identify areas where run-off or erosion occurs from fields or other parts of the farm such as roads and tracks.	●	●		●	●	●	●
		3. Consider the potential ground conditions at harvest time and post harvest for high risk crops when planning your crop location and surface water risk management solutions (See Sec. 4.6 / 4.7 for further information).	●	●		●	●	●	●
4.2	**Field operations:** Ensure you check weather and ground conditions before accessing fields to undertake any nutrient spreading	1. Avoid rutting and compaction by not trafficking on wet soil wherever possible.	●	●		●	●	●	●
		2. Plant cover crop / winter crop to avoid leaving soil bare for long periods, especially over winter**.**	●	●		●	●	●	●
If conditions are likely to cause a risk of erosion, soil / nutrient loss, leaching or compaction be prepared to suspend work, including that of contractors, in adverse weather conditions. See chapter 2. Nutrients for information on nutrient applications and weather conditions.									
4.3	**Poaching:** Minimise soil erosion and compaction by managing livestock to prevent poaching whenever possible.	1. Review the current situation by examining the management of livestock areas on your farm.	●	●		●	●	●	●
		2. If planning to graze stock outdoors during the winter months consider the following factors: • soil type • condition and erosion risk • stocking densities • grazing pattern • stock health • provision of stock access • feeding and drinking areas • weather patterns • livestock types • management requirements on designated land (e.g. SSSI) or land under agreement (e.g. Environmental Schemes).	●	●		●	●	●	●

4.0 Soil / Cropping / Environment			Benefits						
No.	**Item**	**Outcome**							
		3. Remove stock from the land when the soil is too wet. Allow the site time to recover in the spring, cultivate and re-seed, as necessary, and when conditions allow, to re-establish green cover.	●	●		●	●	●	●
		4. Where possible provide hard standing around permanent feeders, water troughs and in gateways.	●	●	●	●	●	●	●
		5. Move supplementary feeders regularly to avoid poaching the soil. Ensure all locations do not sit in a surface water flow rout, so lead to run-off and erosion.	●	●		●	●	●	●
		6. Check Cross Compliance Regulations to ensure where feeders are positioned is compliant.	●	●		●	●	●	●
Check your land regularly for signs of poaching and brown water runoff, particularly during wet weather. If signs of pollution occur consider simple changes to livestock management if hoof marks from cattle are deeper than fetlock depth. If poaching persists despite the implementation of best farming practices, you should consider the cost benefit of housing livestock during wet periods.									
4.4	**Soil Management Plan:** A soil management plan will help you to provide optimum conditions for the growth of crops and grass, whilst minimising the risk of run-off and erosion.	1. Undertake an assessment of the risks of run-off and erosion for your whole farm. Look out for soils damaged by poaching or vehicle movements, brown water runoff or watercourse pollution.	●	●		●	●	●	●
		2. Identify risks on a farm map and implement techniques to deal with erosion and runoff risks.	●	●		●	●	●	●
		3. Identify potential opportunities for improving management of livestock areas to protect your soils.	●	●		●	●	●	●
		4. Compile a farm record of erosion risk and runoff management on a field by field basis.	●	●		●	●	●	●
		5. Soil sample and plan field management to ensure good structure and maintain the infiltration of rainfall. Some recommended techniques to use; ✓ *soil slitting* ✓ *subsoiling*	●	●		●	●	●	●

4.0 Soil / Cropping / Environment			Benefits						
No.	**Item**	**Outcome**							
4.5	**Organic matter:** This will improve soil stability and increase workability by returning crop residues back into the soil.	1. Maintain or increase soil organic matter by; ✓ *Apply bulky organic manures* ✓ *Introduce grass or green manures into the rotation.*	●	●	●	●	●	●	●
Remember to adjust your fertiliser use accordingly especially if introducing nitrogen fixing crops such as clover. *A comprehensive* ***Nutrient management plan*** *should include:* ***Fertilizer needed = Crop requirement - Nutrient from other sources*** *(Soil supply, organic manures: Livestock, sewage sludge, digestate, compost, industrial waste)*									
4.6	**Cultivations:** Appropriate cultivations can cut costs, reduce damage to the environment and increase yield. Excessive or inappropriate use of powered cultivations can increase the risk of soil damage and erosion on some soils through compaction. It can also damage your crops or coat them in soil, which increases processing costs.	1. Consider ways to avoid leaving bare soil, particularly a fine tilth, for any length of time. By using cover crops such as green manures you can reduce soil erosion and provide soil nutrients. 2. Check soil for compaction to improve crop growth and increase infiltration. This can be done by digging a hole to create a soil pit or a penetrometer / rod pushed into the ground – by measuring the depth of the rod if it becomes harder to push, you can identify the depth of any compaction. (For further information see 'Think soils' / seek professional advice.) Record any signs of soil compaction within your soil record sheet and implement remediation techniques outlined in this chapter. 3. Ensure you maintain and calibrate equipment regularly to ensure accuracy of nutrient applications and tilling / planting. This reduces pollution risks and improve efficiencies by more accurate applications to field conditions.	● ● ●	● ● ●	 	● ● ●	● ● ●	● ● ●	● ● ●
Note: The time available for autumn fieldwork varies considerably across Wales, with not all techniques being universally applied with success. Wherever you farm, select the most appropriate establishment system for your land. Decide when to plough or use shallow minimum tillage to minimise soil loss by considering cropping, weather, slope and soil conditions. It is proven that cover crops can reduce nitrate leaching by 50 per cent, enabling you to reduce fertiliser applications and save money. Cover crops established over winter can be used for lamb production to improve pastures and provide a break in crop rotations.									

4.0 Soil / Cropping / Environment			Benefits						
No.	**Item**	**Outcome**							
		Environmental enhancements							
4.7	**Buffers:** Buffer strips provide protection for vulnerable habitats within the landscape and reduce the risk of pollution to water by overland flow, and spreading methods. By providing long grass or hedgerows alongside watercourses sediment is captured within the grass as surface water is slowed within the grass**.** **Buffer strips** can be used to protect surface water and wetlands, hedgerows and field access points by preventing soil wash, nutrient run-off, and spray drift.	1. Consider leaving an appropriate uncultivated and unsprayed strip around the outside of the field to protect any hedgerow and provide a buffer strip. This can be defined by the land use, slope, proximity to a watercourse and vegetation type of the field margin proposed.	●	●		●	●	●	●
		2. By identifying where risk of soil wash is high you could construct a swale to capture sediment runoff. A swale is a shallow and relatively wide vegetated ditch. This provides temporary water storage and the possibility of infiltration under suitable conditions.	●	●		●	●	●	●
		3. Consider creating hedgerow planting across the slope to slow downhill flow of water and create shelter for livestock / reduce soil erosion.	●	●		●	●	●	●
		4. Consider installing earth banks, and /or other physical barriers such as ponding sites where severe erosion occurs. This checks the flow of water to reduce off-site impacts. (See CoGAP 4.2.2 Field Management for further info).	●	●		●	●	●	●
		5. Consider where grass buffer strips alongside watercourses will help to reduce the risk of overland flow.	●	●		●	●	●	●
		6. Consider where native woodland planting on high risk surface water runoff and erosion areas could stabilise and protect soils as well as reduce diffuse pollution and soil erosion.	●	●		●	●	●	●
		7. Consider fencing off surface water where appropriate to allow natural vegetation to colonise. This protects the soils from excessive trampling from livestock and prevent direct deposit of manure to the surface water.	●	●		●	●	●	●
		8. Consider methods such as light grazing to remove scrub from natural wetlands and prevent it from becoming established.	●	●		●	●	●	●

4.0 Soil / Cropping / Environment			Benefits						
No.	**Item**	**Outcome**							
		9. Consider ways to increase biodiversity and help combat flooding downstream by creating wetland buffer zones, including wet woodland, along watercourses.	●	●		●	●	●	●
		10. Consider the value of rejuvenating farm ponds and establish new ones. They can be used to encourage wildlife, trap excess nutrients and sediment, and provide water for fire fighting.	●	●		●	●	●	●
		1.7 Consider the value and appropriateness of creating a reed bed to treat contaminated runoff or weak effluents from your farm buildings and yards. (See Appendices for the definition of dirty water).							
		A variety of plants including common reed and yellow flag iris can be used. By incorporating a willow plantation in your treatment system you can grow a biomass fuel crop as a by-product.	●	●	●	●	●	●	●

If you are considering installing a* Constructed wetland *you should seek specialist advice from* Natural Resources Wales / a specialist *on their construction, location, and the nutrient loading they receive to ensure it is compliant and capable of treating the BOD loading received.

Moorland and Grassland

IN THIS SECTION:

- Grassland management
- Moorland – habitat areas

Moorland and Grassland

What is :

Grassland and moorland areas are among the most cherished landscapes in Wales. They support a wide variety of wildlife and form the head waters of many of our lowland rivers. Within Wales 60% 0f our landscape is defined as field pattern / mosaic, with 20% categorised as open land. 80% of this agricultural land is located in the uplands, and is defined as less favoured areas.

These uplands play a significant role in storing and purifying our drinking water. They also serve as a natural buffer that helps to control flooding and mitigate drought. Upland streams and rivers provide important spawning and nursery areas for salmon and sea trout. In addition to this these landscapes form a carbon store in the upland soils – particularly in peat. This makes them an important resource for helping to combat the effects of climate change.

Good grass and moorland managemant ensures we can maximise on the value of this natural resource, improving the nutrient and fodder value of grasslands for livestock farming, whilst managing the risks of compaction caused by grazing in wet weather causing increased poaching and runoff.

Whilst considering the benefits of good grassland and moorland management to protect your land, remember it also enriches wildlife habitats and landscapes, enhances tourism, protects soil carbon and helps prevent water pollution, flooding and drought.

Benefits:

Improved grazing and nutritional value - Manage livestock numbers and location to avoid under-grazing, over-grazing and poaching

Reduced sward restoration costs - Reduce soil damage, erosion and runoff caused by vehicle and stock movements and the lack of ground cover

Sustained yields and productivity - Avoid applying manure and fertiliser near streams and rivers, on steep slopes or in fields that are prone to flooding

Cleaner rivers and streams - Protect features such as streams to enhance fisheries, and maintain trees and hedges. They enhance the landscape, help to protect soils, and provide shelter for livestock and habitats for wildlife

Higher capital value for your farm - Use wide buffer strips and woodland to intercept sediment before it reaches streams and rivers. This creates less time and money spent clearing ditches and roads and increases diversity of wildlife.

Useful links:

- RB209 grass and forage crops
- Farming Connect
- HCC

5.0 Grassland & Moorland			Benefits						
No.	**Item**	**Outcome**							
5.1	**Grassland management:** Grassland and moorland areas are among the most cherished landscapes in Wales. They support a wide variety of wildlife and form the head waters of many lowland rivers. Managing uplands sustainably play a significant role in storing water to control flooding, reduce drought risk and clean our streams and rivers. Risks such as compaction can be caused by grazing in wet weather. This increases risks of poaching and runoff into streams and rivers. Good grassland and moorland management protects your land. It also enriches wildlife habitats and landscapes, enhances tourism, protects soil carbon and helps pprevent water pollution, flooding and drought. A large amount of carbon is stored in upland soils – particularly in peat – which makes them an important resource for helping to combat the effects of climate change.	1. Consider methods to reduce compaction where it has been identified within improved grassland areas. This could include grassland management, soil aeration or subsoiling to improve infiltration potential, and crop growth / health.	●	●		●	●	●	●
		2. Consider livestock numbers and location to avoid over-grazing and poaching of fields at risk of runoff / erosion. *By identifying flow routes on your farm you can ensure you manage the risk of diffuse pollution by managing your land correctly.*	●	●		●	●	●	●
		3. Ensure soil damage is managed to stop erosion and runoff caused by lack of ground cover, vehicle and stock movements. *Grazing of root crops and feed stations can create erosion risks alongside compaction and livestock paths leading to streams and rivers.*	●	●		●	●	●	●
		4. Avoid applying manure and fertiliser near streams and rivers, on steep slopes or in fields that are prone to flooding. *(See chapter 1. Nutrients for best practice advice on nutrient applications).*	●	●		●	●	●	●
		5. Consider ways to protect features such as streams, trees and hedges by ensuring runoff and poaching does not occur. These features enhance the landscape, help to protect soils, and provide shelter for livestock and habitats for wildlife.	●	●		●	●	●	●
		6. Consider using wide buffer strips and woodland to intercept sediment before it reaches streams and rivers. These provide multiple benefits by reducing nutrient and soil runoff and increasing habitat value and biosecurity by increasing water quality within your rivers.	●	●		●	●	●	●

5.0 Grassland & Moorland			Benefits						
No.	**Item**	**Outcome**							
		Moorland							
5.2	**Moorland / habitat areas:** Upland peat soils are a major carbon reservoir. When you protect these soils, you will help to prevent the release of carbon dioxide into the atmosphere and reduce the burden of climate-changing emissions. These rough grazing and moorlands dominate the uplands, providing a wide range of landscapes and habitats. Poor land management of these landscapes can degrade moorland and makes it vulnerable to erosion.	1. Consider when undertaking moorland management ways to avoid leaving bare soil to reduce the risk of erosion. *Examples of this include leaving cut bracken to avoid bare soil following bracken control operations, particularly on sloping sites with a risk of erosion.*		●	●		●	●	●	
		2. Consider methods to mitigate all risks of surface water runoff to water bodies using sustainable drainage techniques when undertaking moorland management. A Burning Management Plan needs to be provided to identify location and area of burning and dates of work completed.		●	●		●	●	●	
		3. Consider the timings of when you remove grass and other vegetation – such as scrub, bracken and heather – from hill slopes and valley bottoms to ensure bare soil is not left over winter.		●	●		●	●	●	
		4. Consider blocking grips on the moorland to reduce runoff. You will need to consult the moorland owner / NRW for advice and approval when planning this.		●	●		●	●	●	
		5. Consider pasture management techniques to reduce grazing pressure and allow soils and heather to recover.		●	●		●	●	●	
		6. Consider restoring sparse hedges, or plant new hedges across slopes to reduce the risk of runoff and soil erosion and provide habitat for birds.		●	●		●	●	●	

Water efficiency

IN THIS SECTION:

- Water efficiency

Water efficiency

What is:

Using less water saves money. Agriculture is an important part of the water cycle, accounting for around 70 per cent of the global water use. Environments such as Wales are fortunately blessed with an abundant supply of water, however climate change and increasing demands on water supplies due to population growth and industry means we must look to protect this natural resource, ensuring both quantity and quality are conserved, and improved with good farming practices.

The way you farm can have a big influence on water quality and availability. By understanding how water flows around your farm, through streams, rivers and aquifers, and overland in heavy rainfall you can identify how farming practices interact with these features and risk affecting water quality through nutrient losses. This will help you control costs and reduce pollution risk.

By ensuring you protect your water quality, you are protecting quantity, so developing a resilient supply to your soils, and livestock in challenging weather conditions.

Over the past 10 years 57% of farmers say they have experienced extreme weather conditions. With changing weather patterns, increased storm events in summer months, and an increasing demand on water usage by industry feeding a growing population means it is everyones responsibility to manage our water supply sustainably and to create resilience on farm.

Benefits:

The benefits of ensuring you have a sustainable water supply include the following:

- Drought tolerance
- Cost savings
- Reduced consumption
- Less dependence on abstraction licences
- Lower irrigation costs
- Reduced dirty-water disposal costs

Solutions such as rain water harvesting from roof areas and the covers of slurry stores to use for stock drinking water (after UV filter treatment) can reduce demand and also provide water for washing down yards and machinery. This reduces your use of mains water and cuts costs.

Useful links:

- **AHDB:**
- Efficient use of water on a dairy farm (2015)
- Dairy water audit pack
- Dairy Housing (Water Provision)

6. Water Efficiency

No.	Item	Outcome	Benefits						
									
6.1	**Water Efficiency:** Water is an important resource for farmers, but it is sometimes taken for granted. The risk of increasing costs and access to sustainable ground water supplies should drive more awareness and efficiencies within your business. Climate change is creating a pattern of wetter winters and drier summers, so it's increasingly important to use these limited resources as effectively as possible. There are a number of low-cost measures to improve water efficiency that can be taken on most farms. By being aware of your water demand, and it's uses you can assess the sustainability of your supply and the demands you are making. This improves efficiencies and reduces costs across your business.	1. Consider carrying out a water audit using a water audit calculator such as AHDB's Water audit pack. https://dairy.ahdb.org.uk/media/105314/diy%20full%20water%20audit%20pack.pdf		●	●	●		●	●
		2. Review your water use quarterly, any increase in use may indicate leaks in your system. *Potential water losses could increase volumes of dirty water / slurry in your system, or reduce available volumes in summer months by depleting your ground water supply.*		●	●	●		●	●
		3. Consider ways to reuse water where possible. In summer months where water supplies might be limited reusing water can give you resilience to drought. *Water quality of these supplies should be monitored to ensure you don't negatively impact on your livestock's health and performance.*						●	●
		4. Check for, and deal with, drips, overflows and leaks. Drips can loose litres of water a day, potentially increasing volumes of slurry and costing unnecessary money to the business.		●	●	●		●	●
		5. To reduce water usage consider using a pressure wash instead of a low-pressure hose. increases efficiencies due to time saving and water costs.		●	●			●	●
		6. Consider the benefits of installing a high-pressure wash system for bulk tanks. *Efficiencies in the dairy industry can help save time and money, so making your business more resilient to economic and climate risks.*			●			●	●
		7. Consider harvesting rainwater and developing alternative supplies. The returns of these investments can deliver long term gains to your business, and protect you from the risk of increasing utility bills if on a mains supply. This can be tied in with building works such as roofing over yards or improving guttering to reduce surface water volumes into slurry stores.		●	●	●		●	●

6. Water Efficiency			Benefits
No.	Item	Outcome	
Quantity: Leaks in farm water supplies cost farmers money. Livestock farmers may suffer the additional cost of extra slurry storage and application. Every outlet and joint in a water system is an opportunity for leakage. A single dripping tap can cost as much as £50 a year in mains water. **Quality:** Water contaminated with bacteria or chemicals can harm livestock and people. Contamination can enter supplies via leaks or open pipes, through unprotected storage tanks and through pollution of a spring, well or borehole. Simple actions, such as dealing with leaks swiftly and cleaning your storage tanks, can reduce the risk of contamination, protect against sickness and avoid clean-up costs. If the farm is abstracting more than 20 m3/day (20,000 litres a day) you must apply for an abstraction licence. Further details can be found on the Natural Resources Wales website.			

Risk management

IN THIS SECTION:

- Environmental Accident and Emergency plan
- Nutrient Management Plan
- Manure management plan
- Risk Maps
- Crop Protection Management Plan

Risk management

What is:

Any farm activity which generates, stores or discharges nutrients poses a potential risk to water quality within our farms.

These are called point source and diffuse pollution. Pollution coming from a single identifiable source, such as a building, store or field is known as point source pollution. The main causes of these incidents are overflows or leaks from slurry stores, seepage of silage effluent from silage facilities from yard drainage not connected to slurry stores, spillage or leaks of agro-chemicals, oils or sheep dip chemicals.

Diffuse pollution can come from many fields or sources within a catchment over time, and is not caused by a single event or action. An example of this is where excess slurry is applied to several fields in a river valley. The runoff from one field may not appear too large a problem, but the combined runoff could result in poor water quality and cause the loss of blue flags at designated bathing waters, or render a stream unsuitable for livestock watering.

To ensure you are protecting your business, nutrients and the environment evidencing best practice enables you to focus on managing and mitigating these risks and access earned recognition through the Water Standard.

Things to consider when identifying risks, and methods to manage them include ensuring all farm staff and any contractors employed on farm know their responsibilities and are familiar with the causes and effects of pollution. Ways to deliver this include ensuring they have:

- ✔ Received appropriate training for what they have to do
- ✔ Know how to operate and maintain the equipment they use
- ✔ Know what to do in an emergency
- ✔ Be able to follow any emergency plan you have for your farm
- ✔ Comply with any risk assessments you have made, for example, in manure, nutrient, soil or crop protection management plans
- ✔ Be aware of the presence of areas which they might damage in the course of their work, such as:–
  - o Source Protection Zones, and near springs, wells and boreholes
  - o Sites of Special Scientific Interest; or other protected areas
  - o Land under agri-environment or other management agreements
  - o Sensitive archaeological sites

Clarifying the roles and responsibilities of the farmer and the contractor through a written agreement with any contractors illustrates who is responsible for the task in hand. This will help to avoid problems if it is not clear who is responsible, you could both be held liable for any problems or pollution incidents that happen.

Check all surface waters frequently to make sure that they are not polluted. Particularly check at times of high risk such as when slurry, silage effluent or dirty water is being applied, or shortly after heavy rain.

Look for signs of soil erosion and run-off which is sometimes referred to as soil wash, including damage to the banks by livestock, poaching of ground by livestock, ponded water in fields, gullying and run-off along 'tramlines'. By using the advice given in the Water Standard it will help you take appropriate action to manage risk, and deliver benefits to water quality on farm and the surrounding landscape.

Benefits:

The benefits for identifying and managing risks on farm include;

- **Maximising natural resources** on farm
- **Fewer agricultural pollution incidents** and less diffuse pollution
- Better **water, soil, air and habitat** quality
- Making better use of nutrients
- Developing methods to **combat climate change**
- Developing **market advantages** by demonstrating **sustainable production standards**

Useful links:

- CoGAP
- Tried and Tested - NMP booklet

7. Risk			Benefits						
No.	Item	Outcome							
7.1	**Environmental Accident and Emergency plan:** On farm emergency plans provide reassurance to the regulator and the farmer that risks have been identified and a process put in place to help you deal with incidents if they happen. A risk plan should include: Contact list & details; emergency services, regulators (e.g. NRW and local Authority), water supplier, sewer provider, Health and Safety Executive, downstream water abstractors and landowners, and specialist clean-up contractors. **Self reporting:** If you are aware of a risk arising it is best to self report your concerns about pollution from slurry storage to Natural Resources Wales Customer Care line on 0300 065 3000 to report the risk / for further advice.	**Create a risk plan of your farm and assets including;** 1. Contact list and details 2. key holders or staff to be contacted in an emergency 3. A site plan showing: a. the layout, access and drainage arrangements for all relevant buildings and structures, all drains, inspection manholes and gulleys – both for clean and foul drainage systems b. location of streams, ditches, soakaways; springs, wells and boreholes near the site c. location of holding facilities that can be used during an emergency. Pollution interception equipment for plugging drains / ditches and points to block to contain spillages. 4. Any follow up action once emergency is passed such as informing NRW of SSSI damage.		●				●	●
				●				●	●
				●				●	●
				●				●	●
A template for a simple farm system is given in Appendix 4 of CoGAP and which can be added to in more complex situations. It is best to review your plan after an incident, when systems involving potential pollutants are altered, or relocated and at least every 3 years.									
7.2	**Nutrient Management Plans:** See Chapter 1. No.1.1. For details on best practice for developing a Nutrient Management Plan.								
7.2	**Manure management plan:** Manure management plans help provide you with an economic and environmentally friendly way of dealing with livestock manures (slurry and solid manure) and dirty water. This is by ensuring you apply them to agricultural land at appropriate rates to meet the soil and crop requirements. These plans, combined with a nutrient management plan, help make the most of your livestock manures to reduce your fertiliser bill and reduce the risk of water pollution in your streams and rivers.	1. Produce a manure management plan, including: • An assessment of the need for any extra slurry or dirty water storage • A field-by-field risk map including: • Slope • Soil type • Fields or parts of fields where livestock manures and dirty water should never be spread • Areas where livestock manures and dirty water should not be spread under certain conditions or where application rates should be restricted • Position of surface waters and water supplies	●	●				●	●

7. Risk			Benefits						
No.	Item	Outcome							
	field-by-field risk map's should be drawn up to highlight: No Spread zones (red) Very high risk areas (orange) High-risk areas (yellow) Lower risk areas (green)	You can draw up your own plan or obtain professional advice from a consultant. Identify on the map any areas affected by regulations and with other management agreements where lower spreading rates may apply (e.g. organic standards and agri-environment schemes).							
		2. Calculate the minimum area of land needed for spreading livestock manures by using agreed maximum field application rates. You should use standard tables or an analysis of your manures for this.	●	●				●	●
		3. Assess if you have sufficient land available to spread your livestock manures and dirty water within the relevant restrictions. Ensure you have considered: stocking levels and manure transfer if a surplus is identified.	●	●				●	●
		4. Consider if accepting materials from other sources such as sewage sludge, green waste compost or other organic materials you have enough land available after spread nutrients generated on your own farm. *Ensure that you update your records if your land area, livestock numbers, dirty yard area or other changes affecting the volume of slurry or dirty water produced changes.*		●				●	●

For additional guidance to help you decide when and where to safely spread slurry, solid manure, dirty water, silage effluent and other organic materials see the **Code of Good Agricultural Practice: Chapter 3. Management plans. CoGAP**

Information in the plans should be available to all who has an input to the business, including consultants, farm staff and contractors, it should be consulted regularly and shared with everybody using them when they are reviewed to capture their contributions. For further information / support you may wish to consult with farm assurance providers /suitably qualified consultants.

Flood Risk

IN THIS SECTION:

- In this section:
- Flood plain woodland
- Riparian Woodlands
- Catchment woodlands
- Land and soil management
- Storage

Flood Risk

What is:

Climate change is expected to affect rainfall in winter and summer, resulting in more extreme weather events. Floods and droughts are both more likely and could have a significant impact on farm businesses. Adopting practices to help the land absorb and slow the flow of water will reduce the risk of flooding further down the catchment, and maintaining soil organic matter levels will retain water to aid crop and livestock yields.Climate change, population growth, economics, and environmental legislation such as the Floods Directive and Water Framework Directive all necessitate a move towards a more integrated, catchment based approach to the management of land and water. Working in this way creates efficiencies in how we manage our environment by recognising that many issues in catchments affect many different sectors and that where land and water are managed together at the catchment scale this can bring about whole catchment improvements and multiple benefits to society. A key component of managing water on farm and within the catchment is the recognition that working with natural processes to manage the sources and pathways of flood waters can benefit flood risk in other parts of the catchment, including our coastline.

Benefits:

The aim of managing water within a river catchment to provide flood risk prevention and public goods are:

- reduce the rate or amount of runoff; and/or
- improve the ability of rivers and their floodplains to manage flood water. These aims are achieved by storing more water on the land and/or slowing the flow of water overland or instream. Some NFM measures also seek to maintain channel capacity by reducing the amount of sediment deposited within the river channel.

The desired effect of this on flooding is to:

- reduce the downstream maximum height of a flood (the flood peak) thus reducing the scale and impact of the flood; and/or
- delay the arrival of the flood peak downstream, thus increasing the time available to prepare.

Table 2.1. River and catchment based natural flood management measures

Measure group	Measure type	Main action*
Woodland creation	Catchment woodlands	Runoff reduction
	Floodplain woodlands	Runoff reduction/floodplain storage
	Riparian woodlands	Runoff reduction/floodplain storage
Land management	Land and soil management practices	Runoff reduction
	Agricultural and upland drainage modifications	Runoff reduction
	Non-floodplain wetlands	Runoff reduction
	Overland sediment traps	Runoff reduction/sediment management
River and floodplain restoration	River bank restoration	Sediment management
	River morphology and floodplain restoration	Floodplain storage/sediment management
	Instream structures (e.g. large woody debris)	Floodplain storage
	Washlands and offline storage ponds	Floodplain storage

*Corresponding to opportunity areas identified by SEPA's NFM maps – see Chapter 5.

Source: https://www.sepa.org.uk/media/163560/sepa-natural-flood-management-handbook1.pd

8. Flood Risk			Benefits						
No.	**Item**	**Outcome**							
8.1	**Flood management techniques:** Natural flood management (NFM) is when natural processes are used to reduce the risk of flooding and coastal erosion. It produces multiple benefits for people and wildlife, including helping restore habitats, improve water quality and helping make catchments more resilient to the impacts of climate change. To develop and deliver benefits to flood risk and water quality NFM is best delivered on a catchment scale. This uses catchment hydraulics to develop a plan to manage the flow of water along the whole length of a river catchment from 'source to sea'. Natural processes are used to compliment engineered flood defences – such as walls and weirs – in populated areas.	1. Consider the value of implementing a **Floodplain woodland** for downstream flood mitigation. The Natural Flood Management value depends on the size and positioning of the woodland in relation to the size of the floodplain. A number of small blocks spread across the floodplain could be as effective as one large block spanning its entirety. 2. Consider the value of planting **riparian woodlands** to act as a buffer zone in between the watercourse and adjacent land. These widths vary, dependant on location and the volume of runoff you are trying to manage, however they can be **up to** 30m wide on both sides of the watercourse. This offers the benefits of infiltration, hydraulic roughness and evapotranspiration as well as the potential for woody debris (porous dams which can encourage out-of-bank 'spill over' and therefore delay downstream flood flows). 3. Consider planting a **catchment woodland / hedgerow** on pathways where water flows to streams, or rapid run off. These are on soils typically waterlogged or those that suffer from compaction or sealing. Deeper rooting species are preferred to maximise infiltration and soil stability. 4. Consider the value of undertaking **land and soil management practices.** The adoption of good land and soil management practices can reduce the risks to soil posed by certain land management practices and in many cases can improve overall yield by improving the productivity of soils (e.g. by relieving compaction and improving root penetration). These practices typically seek to improve soil structure and/or increase cover so as to reduce erosion, increase soil infiltration, and reduce runoff and transport of sediments. A variety of techniques may be adopted including: • cover crops; • checking for and relieving compaction where required; • soil aeration; • machinery practices that minimise compaction; and • runoff control features (e.g. in-field buffer strips, hedges).	●	●		●	●	●	●
			●	●		●	●	●	●
			●	●		●	●	●	●
			●	●		●	●	●	●

8. Flood Risk			Benefits						
No.	Item	Outcome							
		5. To improve water quality and resilience consider creating an **offline storage pond**. These are areas next to a river or stream where flood water is directed at times of high flow. Typically, water is diverted and temporarily stored in purpose-designed areas of the floodplain where there is sufficient area for storage. These storage areas then drain back out into the watercourses after the main flood peak has passed downstream, usually via a controlled outlet.	●	●		●	●	●	●

The contents of this chapter has been drawn together from a number of sources including the SEPA Natural flood Management handbook - a practical guide to the delivery of natural flood management to benefit flooding. This document is informed by a number of demonstration projects and studies commissioned by SEPA and partners in recent years. For further information see: https://www.sepa.org.uk/media/163560/sepa-natural-flood-management-handbook1.pdf

Glossary of terms and useful references

IN THIS SECTION:

- Glossary of terms and useful references

Glossary of terms and useful references	
Attenuation basin / pond	A pond providing the temporary storage of runoff to reduce the risk of pollution and flooding.
Biosolids	Treated sewage sludge.
Biochemical Oxygen Demand (BOD)	Measure of organic matter in milligrams of oxygen/litre of water. It is used to show the polluting strength of livestock manures and other materials. A Grade 1 surface water7 normally has a BOD of less than 3mg/l, any loading in excess of this can be considered a pollutant. When naturally occurring micro-organisms such as Algae in water break down organic matter they use oxygen in the water, suffocating fish and wildlife. In severe cases this can kill all river life.
Broiler/turkey litter	A mixture of bedding material and poultry excreta which is sufficiently dry to be stored in a stack without slumping.
Closed period	Period of the year when nitrogen fertilisers or certain manures should not be applied unless specifically permitted. Closed periods apply within NVZs.
Coefficient of variation	(CV) Measure of the unevenness of application of fertilisers or manures. CV of 0% indicates (fertiliser or manure spreading) perfectly even spreading, unachievable in practice. Correct operation of a well set-up spreader should give a CV of 10% for fertilisers and 25% for manures under field conditions.
Compost	Organic material produced by aerobic decomposition of biodegradable organic materials.
Constructed Farm Wetland (CFW)	For the treatment of lightly contaminated runoff from concrete yards, hard standing, roads and tracks. If you wish to build a CFW contact Natural Resources Wales for advice and guidance on suitability of your proposal.
Crop available nitrogen	The total nitrogen content of organic manure that is available for crop uptake in the growing season in which it is spread on land.
Crop nitrogen requirement	The amount of crop available nitrogen that must be applied to achieve the economically optimum yield.
Denitrification	Microbial conversion of nitrate and nitrite in anaerobic soil to nitrogen gas and some nitrous oxide.
Deposition	Transfer of nutrients from the atmosphere to the soil or to plant surfaces. The nutrients, mainly nitrogen and sulphur , may be dissolved in rainwater (wet deposition) or transferred in particulate or gaseous forms (dry deposition).

Diffuse pollution	Nutrient runoff from many fields or sources within a catchment over time, and is not caused by a single event or action. An example of this is where excess slurry is applied to several fields in a river valley. The run-off from one field may not appear too large a problem, but the combined run-off could result in poor water quality and cause the loss of blue flags at designated bathing waters, or render a stream unsuitable for livestock watering.
Dirty water	Lightly contaminated run-off from lightly fouled concrete yards, hard standing, roads and tracks collected separately from slurry . It does not include liquids from weeping-wall stores, strainer boxes, slurry separators or silage effluent which are rich in nitrogen and regarded as slurries.
Economic optimum (nitrogen rate)	Rate of nitrogen application that achieves the greatest economic return from a crop, taking account of crop value and nitrogen cost.
Efficiency factor (manures)	Percentage of total nitrogen in a manure that is available to the next crop. There are mandatory minimum values in NVZs for use when estimating the nitrogen contribution of manures.
Eutrophication	Enrichment of ecosystems by nitrogen or phosphorus. In water it causes algae and higher forms of plant life to grow too fast. This disturbs the balance of organisms present in the water and the quality of the water concerned. On land, it can stimulate the growth of certain plants which then become dominant so that natural diversity is lost.
Excess rainfall	Rainfall between the time when the soil profile becomes fully wetted in the autumn (field capacity) and the end of drainage in the spring, less evapo-transpiration during this period (i.e., water lost through the growing crop).
Farmyard manure (FYM)	Livestock excreta that is mixed with straw bedding material and can be stacked in a heap without slumping.
Liquid fertiliser	Pumpable fertiliser in which nutrients are dissolved in water (solutions) or held partly as very finely divided particles in suspension (suspensions).
Frozen hard	Soil that has been frozen for more than 12 of the preceding 24 hours. Days when soil is frozen overnight but thaws out during the day do not count.
Granular fertiliser	Fertiliser in which particles are formed by rolling a mixture of liquid and dry components in a drum or pan. Typically , particles are in the 2–4mm diameter range.
Greenhouse gas	Gas such as carbon dioxide, methane or nitrous oxide that contributes to global warming by absorbing infra-red radiation that otherwise would escape to space.
Groundwater	all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

Layer	manure Poultry excreta with little or no bedding.
Leaching	Process by which soluble materials, such as nitrate or sulphate, are removed from soil by drainage water passing through it.
Lime requirement	Amount of standard limestone needed in tonnes/ha to increase soil pH from the measured value to a higher specified value (often 6.5 for arable crops). Determined by a chemical test.
Livestock manure	Dung and urine from livestock or a mixture of litter , dung and urine, even in processed organic form. Includes FYM, slurry , poultry litter , poultry manure, separated manures, granular or pelletised manures.
Maintenance application	Amount of phosphate or potash that must be applied to replace the amount removed from a (phosphate or potash) field at harvest (including that in any straw, tops or haulm removed).
Major nutrient	Nitrogen, phosphate and potassium that are needed in relatively large amounts by crops (see also Secondary nutrients and Micronutrients).
Manufactured fertiliser	Any fertiliser that is manufactured by an industrial process. Includes conventional straight and NPK products (solid or fluid), organo-mineral fertilisers, rock phosphates, slags, ashed poultry manure, liming materials that contain nutrients.
Micronutrient	Boron, copper , iron, manganese, molybdenum, zinc that are needed in very small amounts by crops (see also Major nutrients). Cobalt and selenium are taken up in small amounts by crops and are needed in human and livestock diets.
Mineral nitrogen	Nitrogen in ammonium and nitrate forms.
Mineralisable nitrogen	Organic nitrogen that is readily converted to ammonium and nitrate, for example during spring.
Mineralisation	Microbial breakdown of organic matter in the soil, releasing nutrients in available, inorganic forms.
Naturally occurring micro-organisms	The flora (plant and bacteria) and fauna found in water. These organisms can multiply as the result of certain types of pollution providing nutrients to encourage growth. In the presence of optimum conditions, algae and aquatic plants can generate, through photosynthesis, vast quantities of organic matter from simple nutrient elements (C, N, P), with repercussions on food chains within the water bodies and decrease the quality of the water causing Eutrophication.
Neutralising value (NV)	Percentage calcium oxide (CaO) equivalent in a material. 100kg of a material with a neutralising value of 52% will have the same neutralising value as 52kg pure CaO. NV is determined by a laboratory test.
Nitrogen uptake efficiency	Uptake of nitrogen from soil, fertiliser or manure expressed as a percentage of nitrogen supply from that source.

Nitrogen use efficiency	Ratio of additional yield produced to the amount of nitrogen applied to achieve that increase. Often expressed as kg additional yield per kg N applied.
Nitrous oxide (N2O)	A strong greenhouse gas that is emitted naturally from soils. The amount emitted is related to supply of mineral nitrogen in the soil so increases with application of manures and fertilisers, incorporation of crop residues and growth of legumes and is greater in organic and peaty soils than in other soils.
Nutrient budget	An account of gains and losses of nutrients in an agricultural system, often used in Nutrient management.
Nutrient management	A process for ensuring that nutrient supplies match, but do not exceed, crop needs on a farm so optimising financial performance while minimising impact on the wider environment.
Offtake	Amount of a nutrient contained in the harvested crop (including straw, tops or haulm) and removed from the field. Usually applied to phosphate and potash.
Olsen P	Concentration of available P in soil determined by a standard method (developed by Olsen) involving extraction with sodium bicarbonate solution. The main method used in the UK and the basis for the Soil Index for P .
Operators	Approved advisor acting as a provider of proficient advice and guidance to the industry on the Water Standard through an understanding of the requirements of a Voluntary Farmer Led Approach to Nutrient Management. Operators have an appreciation of the farmers responsibilities to deliver evidence supporting their chosen deliverables within the water standard. The operator has the ability to act within the role of advisor and auditor dependent on their competencies within the regulator's skills matrix.
Organic manure	Any bulky organic nitrogen source of livestock, human or plant origin, including livestock manures.
Point Source pollution	Pollution coming from a single identifiable source, such as a building, store or field is known as point source pollution. The main causes of these incidents are overflows or leaks from slurry stores, seepage of silage effluent from silage facilities from yard drainage not connected to slurry stores, spillage or leaks of agro-chemicals, oils or sheep dip chemicals.
Readily available nitrogen	Nitrogen that is present in livestock and other organic manures in molecular forms that can be taken up immediately by the crop or is released in these forms in the year in which it is applied (ammonium or nitrate or , in poultry manure, uric-acid N). Equivalent to fertiliser nitrogen. High in slurries and poultry manures (typically 35 – 70% of total N) and low in FYM.
Safe Sludge Matrix	Guidance on sewage sludge use for different crops agreed by Water UK and the British Retail Consortium.

Secondary nutrient	Magnesium, sulphur , calcium or sodium that are needed in moderate amounts by crops.
Sediment Trap	A sediment trap is a dry, shallow, grass basin laid with a shallow fall on its base. Sediment traps collect, retain and treat runoff during rainfall events. Sediment traps are dry structures that temporarily fill with water after rainfall events.
Sediment Trap Bund	A dry, vegetated basin that temporarily fills up during a rainfall event and traps sediments and pollutants. A sediment trap / bund helps reduce sediment loading in ponds and wetlands when constructed directly upstream.
Slurry	Excreta produced by livestock (other than poultry) while in a yard or building (including any bedding, rainwater and washings mixed with it) that has a consistency that allows it to be pumped or discharged by gravity. The liquid part of separated slurry is also defined as slurry.
SNS Index	Soil Nitrogen Supply expressed in seven bands or Indices, each associated with a range in kg N/ha.
Soil Index (P , K or Mg)	Concentration of available P, K or Mg, as determined by standard analytical methods, expressed in bands or Indices.
Soil Mineral Nitrogen (SMN)	Ammonium and nitrate nitrogen measured by the standard analytical method and expressed in kg N/ha.
Soil Nitrogen Supply (SNS)	The amount of nitrogen (kg N/ha) in the soil that becomes available for uptake by the crop in the growing season, taking account of nitrogen losses.
Solid manure	Organic manure which can be stacked in a freestanding heap without slumping.
SuDS wetland	For the treatment of rainfall runoff from roofs and clean / general yards, from fields or from farm tracks.
Surface water	Includes all surface water: coastal waters, estuaries, canals, lakes, ponds, rivers, streams and ditches, including those which are temporarily dry, and blind ditches.
Swale	A dry shallow, vegetated channel that collects, treats and transfers runoff from a steading or field to a downstream Rural SuDS or discharges directly to a watercourse if appropriate (e.g. roof runoff).
Target Soil Index	Lowest soil P or K index at which there is a high probability crop yield will not be limited by P or K supply. See Soil Index (P, K or Mg).
Volatilization	Loss of nitrogen as ammonia from the soil to the atmosphere.
Water-soluble phosphate	Phosphate, expressed as P2O5, that is measured by the statutory method for fertiliser analysis. Not necessarily a measure of available phosphate – high water-solubility indicates high availability but low water-solubility does not necessarily indicate low availability.

Appendices

IN THIS SECTION:

- On farm sources of agricultural pollutants and potential impacts

Appendicies

Roles and responsibilities

Industry: Provides a cross sector standard for farmers to implement the Water Standard through the drafting of guidance on how to develop and deliver the various criteria and indicators listed in the Standard; providing additional references that can guide to websites if more detailed information is required.

Regulators: Provides industry led guidance to help the regulator ensure consistency and rigour in the interpretation and application of the Water Standard and thereby maintain consistency across the industry and Wales' landscape. Through the data development of a 'farm audit' process and evidencing of engagement with the deliverables selected by the farmer within the Water Standard, the regulator is able to facilitate a **'Voluntary Approach'** to a farmer led delivery mechanism for water quality and nutrient management. Appropriate guidance is to be developed to support the Standard as a basis for certification. In addition to this there is a need for the development of auditor training and reference documentation to help auditors interpret the Standard in a consistent manner.

Operators: The role of an operator is to provide proficient advice and guidance to the industry on the Water Standard through an understanding of the requirements of a Voluntary Farmer Led Approach to Nutrient Management. Through this appreciation of the farmers responsibilities to deliver evidence supporting their chosen deliverables within the water standard the operator has the ability to act within the role of advisor and auditor dependent on their competencies within the regulator's skills matrix.

Expectations:

From the beginning of this project it has been emphasised that water varies through space, time and importance to any given commodity – user, existing quality measures, catchment location etc.

Just as water is variable, so too must the solutions be flexible to accommodate varying circumstances. A "one size fits all" solution is not appropriate, nor recommended.

This document captures existing approaches which recognise water as a standard, and collates them together within a Wales specific format including identifying methods to address the current gaps which collaborative approaches to embracing water stewardship may overcome.

The aim of incentivising water stewardship is to offer a self-serving motivation to farmers to help mitigate their water risks and provide a method of evidencing their efforts to consumers, retailers and regulators.

It also assists in a catchment scale to identify and communicate with other 'engagers' on their own impacts with water within the local landscape, and it's impact on the hydrological cycle.

Going forward the need to address water security within our farming system and the surrounding environment is imperative to addressing the ongoing, ever increasing demands on our water quantity, which will be directly affected by water quality.

The Farmer Led Approach offers an opportunity to engage farmers in the value of water on farm and within their local environment.

On farm sources of agricultural pollutants and potential impacts		
On farm risks	**Pollutants**	**Impacts**
Animal housing and farmyard	Ammonia	Siltation / sedimentation
Slurry store (risk of failure, leakage)	Nitrogen	Eutrophication
Manure heap	Phosphorus	Acidification
Roofs	Organic matter	Oxygen depletion
Dairy and milking parlour	Sediments	Microbial contamination
Sheep dipping unit	Faecal pathogens	Human health risks
Vegetable washing unit	Pesticides	Cattle and wildlife poisoning, illness and death
Silage (silo, pit), effluent collection tank, soak-away	Fuel / Oil	Disruption and disturbance of aquatic ecosystems
Chemical store, filling area and spraying equipment	Veterinary medicines and hormones	Loss of biodiversity
Fertiliser store, filling area and spreading equipment	Metals	Ground water contamination
Land runoff (e.g. following land spreading)	Other chemicals	Water supply contamination
Fuel/Oil: storage tank, filling point		Sewage fungus growth
Farm machinery		

Content for this table has been sourced from the SEPA Constructed wetlands manual: https://www.sepa.org.uk/media/131412/constructed-farm-wetlands-manual.pdf

NFU CYMRU

Cyfoeth Naturiol Cymru
Natural Resources Wales

FUW
UNDEB AMAETHWYR CYMRU

Llywodraeth Cymru
Welsh Government

Dŵr Cymru
Welsh Water