Single Payment Scheme

Cross Compliance Guidance for Soil Management

2010 edition

rpa rural payments agency

defra Department for Environment Food and Rural Affairs

Other existing SPS publications:

Title	**Defra publication no.**
Guide to Cross Compliance in England	PB 12904 and PB1290A (updates)
Cross Compliance Soil Protection Review	PB 13311
Cross Compliance Guidance for the Management of Habitats and Landscape Features	PB 12903

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Preface

The Single Payment Scheme (SPS) is a key part of Defra's Strategy for Sustainable Farming and Food. At the same time, all claimants have to meet baseline standards for agriculture and are contributing to environmental protection.

As a condition of the SPS, including the attendant schemes, and certain area related EU Rural Development (RD) schemes, farmers must comply with a series of Good Agricultural and Environmental Conditions standards (GAECs), of which the revised Soil Protection Review (SPR) is GAEC 1. This Guidance will help you to prepare your SPR.

Background

The *Cross Compliance Guidance for Soil Management 2010 edition* covers a number of key changes to the four Good Agricultural and Environmental Conditions (GAECs) for soils, following a review of Cross Compliance and subsequent consultation with farmers and representative bodies in 2009.

The most important changes are;

- The incorporation of the 4 Soils GAECs into a single GAEC 1, which forms an updated Soil Protection Review. These GAECs were
  - GAEC 1 The Soil Protection Review
  - GAEC 2 Post Harvest Management of Land
  - GAEC 3 Waterlogged soil
  - GAEC 4 Crop residue burning restrictions
- You will no longer have to await a Secretary of State exemption to access waterlogged soil
- A more risk based approach to soil protection
- Expanded guidance on retaining Soil Organic Matter
- New guidance on the use of buffer strips alongside watercourses.

This Guidance provides good practice hints and tips to help you better understand your cross compliance requirements, and points you to sources of additional information. Please note that the *Soil Protection Review* must be completed by **31 December 2010**, or by 31 December of the first year you have claimed if that is a subsequent year. You must start completing Part 4, Access to Waterlogged Land from 1 January 2010.

If you have any queries about cross compliance that are not covered in this guidance please telephone the cross compliance helpline on 0845 345 1302.

Contents

1 Introduction

This Guidance should be read in conjunction with the new Soil Protection Review 2010.

Background

1. The Single Payment Scheme (SPS) was introduced in 2005. As a condition of payment, farmers are required to demonstrate that they are:
   - keeping their land in Good Agricultural and Environmental Condition (GAEC); and
   - complying with a number of specified legal requirements relating to the environment, public health, plant health, animal health and welfare, and livestock identification and tracing (Statutory Management Requirements).
2. Meeting these requirements is described in the Common Agricultural Policy legislation as "cross compliance". The farmer requirements for cross compliance are set out in *The Guide to Cross Compliance Handbook for England* (referred to as 'the Guide' in this Guidance).

Purpose of this Guidance

3. This Guidance explains how to prepare your Soil Protection Review (SPR). The SPR document provides a template for you to use in drawing up your review. If you prefer to complete your SPR electronically, you will find an electronic version on the RPA website and an interactive version on the Whole Farm Approach website. www.wholefarm.defra.gov.uk. You should use the template with this Guidance. The SPR template and this Guidance provide good practice hints and tips to:
   - help you complete your SPR; and
   - point you to additional sources of information and advice (see Appendix 2).
4. This Guidance will help you to identify soil degradation risks on your land, and provides options on how to address these risks. It will help you to manage your soils to improve their agricultural potential while at the same time reducing the scope for negative impacts on the environment. It will also help you to understand other soil related-problems on your farm and which good practice measures can help to minimise these problems.
5. This Guidance on soil management applies from 2010. It has been updated in the light of changes in cross compliance requirements and following consultation with farmers, growers and representative bodies.

6. Neither this Guidance nor the Handbook takes the place of the law. You should refer to the legislation for an explanation of your legal obligations. See RPA Website for full details of the legislation at www.rpa.gov.uk/crosscompliance
7. You are required to take account of this Guidance.

What is GAEC for soils?

8. Preventing soil eroding from fields, maintaining soil organic matter and maintaining a good soil structure are central to your responsibility for meeting the soil standard GAEC1.
9. You must begin to use the revised SPR in 2010. The *Soil Protection Review* must be completed by 31 December 2010, or by 31 December of the first year you have claimed if that is a subsequent year.
10. From 1 January 2010, or from 1 January of the first year you claim, you are required to record all qualifying access to waterlogged soil when it occurs, and to record remediation actions when conditions have enabled you to carry them out.
11. If you are subject to a Cross Compliance inspection in 2010 you will have to produce your original SPR (if you were required to complete one) and your 2010 SPR so that the inspector can inspect the Access to Waterlogged Land section (Table D).

Other GAEC requirements affecting soils

12. Although the impact of these standards may be greatest in the arable sector, they are relevant to all agricultural land. You should bear in mind that there are also requirements under the GAEC standards to protect soils for the maintenance of habitats and landscape features. For example, farmers with livestock must comply with the prevention of overgrazing and unsuitable supplementary feeding requirements (GAEC 9).

Acknowledgements

13. The text and illustrations in this Guidance are based on a number of sources, including stakeholders and specialists, which we are pleased to acknowledge. In particular, we are grateful for the substantial contribution made by the Environment Agency to the text. Images were provided by the Environment Agency unless otherwise stated.

Cross Compliance advice

14. For further advice on the soil cross complicance requirements you may contact the Defra/Natural England Farm Advisory Service, which advises farmers on cross compliance requirements. They have a programme of events such as farm walks and talks from advisers and a cross compliance advice helpline, open from 9am to 5pm Monday to Friday.

    There is also a dedicated cross compliance website with guidance and advice.

    Cross Compliance Advice Helpline – 0845 345 1302;

    Cross Compliance Advice Website – www.crosscompliance.org.uk

2 Managing soils on your farm

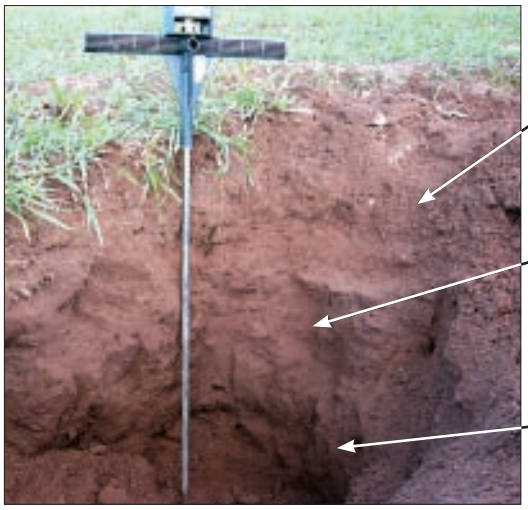
15. Well-managed soils are an important element of sustainable farming practice. Poor soil structure leads to patchy crops from uneven germination, poor growth and greater susceptibility to disease. It can also result in poor drainage and lead to ponding, runoff and soil erosion. Managing soils to reduce the risk of compaction and erosion will help increase yields and the quality of crops and pastures, as well as reducing the risk of damage to the environment. This section explains the soil-related problems (particularly erosion, poor structure and low organic matter) that you may encounter and sets out principles of good practice to help you manage your soils.

Recognising soil structural problems

16. Soil structure is a term used to describe the arrangement of particles into aggregates in the soil. You can see these aggregates if you dig a hole and carefully break the soil apart by hand or using a spade. Organic matter and clay (and, in some soils, calcium and iron) help to bind soil particles together. However, soil is very weak when it is wet and is vulnerable when pressure is applied to it.
17. The state of the aggregates in the soil determines how air and water move in the soil and how well crops and grass can grow. The structure can easily be damaged if the aggregates are broken down by poor soil management.
18. Problems with soils are not always easy to identify.

A well-structured soil

A poorly-structured soil



A poorly-structured topsoil has dense aggregates of soil with few pores and is difficult to break apart even when it is moist.

A subsoil with poor structure is dense and can often be seen as a distinct hard pan with platy structures. There are few pores or cracks in the soil.

Soil beneath the pan may not be dense, or the compaction may extend deeper into the subsoil.

Surface capping

A surface cap is a compacted layer of soil particles often found on bare soils that have been exposed to rain. This cap can restrict crop emergence and lead to runoff and erosion.

19. Looking at the soil during or soon after rain will let you see the stability of the soil surface, how well water is getting into the soil, and where any runoff and erosion may be occurring.

Surface capping, compacted headlands and wheelings all reduce the porosity of the soil and may lead to runoff and erosion.

Compaction

20. Recognising compaction in the topsoil can be identified by seeing a dense single mass of soil, large angular soil aggregates with few pores, fissures or roots. Compacted soil is not friable when moist It can be a grey/blue colour indicating that it is waterlogged and lacking in oxygen. It can also be foul smelling.
21. Compacted soil can take the form of wet soil over dry soil. This can be due to a pan made by machinery or livestock. Testing for compaction prior to planting, after harvesting and regularly in a grass sward can help to improve crop development, yields and can lengthen the number of days available for grazing before poaching occurs.

Compaction in Topsoil

Grassland

Arable crop

Compaction in Subsoil

Grassland

Arable crop

Runoff and erosion

22. Surface water runoff occurs where the rate of rainfall is greater than the rate at which water soaks into the soil.

23. Where runoff occurs on unstable soils (such as on light sandy and silty soils), water erodes and transports soil particles. This may be seen as shallow channels (rills) and sometimes more deeper gullies.

Poaching

24. Poached soil is caused when livestock trample wet soil. Poaching causes compaction and ponding of water.
25. Although hoof marks provide some surface storage of water, runoff can occur during heavy rain.

Waterlogging

26. Normal common sense definitions of 'waterlogged' apply. For example, soil will be considered to be waterlogged where the whole of the plough layer is saturated/filled with a water by virtue of a high water table or water collected (perched) above a compacted soil.

Wind erosion

Picture: John Allen

27. Some sandy soils and peaty soils are at risk of wind erosion.
28. Sandy soils at risk to wind erosion are those with a low clay content (including sand and loamy sand textures), and those with fine soil particles. Sandy loam soils are slightly more stable and are at less risk to blowing.
29. Signs of wind erosion include drifting soil, buried seedlings, and soil blown into hedgerows, ditches and onto nearby roads.

Maintaining soil organic matter

30. Soil organic matter improves the workability and fertility of soils, helps to maintain good structure and reduces the risk of capping, slumping and erosion. Continuous arable cropping reduces soil organic matter and positive action may be needed on some soils to maintain or increase current contents. Organic matter is added to soil by:
    - returning crop residues;
    - introducing cover crops, grass leys or longer periods of grass into the rotation; or
    - applying bulky organic manures.
31. These practices also recycle nutrients, in particular nitrogen, to the land. These nutrients should be taken into account when deciding on a fertiliser policy for the farm. By drawing up a nutrient management plan, which includes all sources of nutrients, farmers can save money on inorganic fertilisers. It will also help to protect the environment from excess nutrients getting into ground or surface water or into other sensitive habitats.
32. It is particularly important to account for all nitrogen additions to land in Nitrate Vulnerable Zones (NVZs). In these areas, farmers must not apply more nitrogen than the crop requires and there are limits on the total quantity of nitrogen that can be applied in organic manures. There are also restrictions on when certain types of manure can be applied. For full details of these and other restrictions in NVZs, you should refer to the Defra booklets *Guidelines for Farmers in Nitrate Vulnerable Zones*. Copies are available free of charge from Defra Publications (quote reference: PB 12736). They can also be viewed and printed from www.defra.gov.uk/environment/quality/water/waterquality/diffuse/nitrate/documents/leaflet4.pdf and www.defra.gov.uk/environment/quality/water/waterquality/diffuse/nitrate/documents/leaflet5.pdf
33. Further details of the help and advice available to comply with the NVZ Action Programme measures are provided on the Defra NVZ web pages at www.defra.gov.uk/environment/quality/water/waterquality/diffuse/nitrate/help-for-farmers.htm
34. Farmyard manures, slurries, composts and other bulky organic manures all help to increase organic matter levels. However, when applying these soil conditioners you must also comply with the relevant legislation including The Sludge (Use in Agriculture) Regulations 1989 (SMR 3); and the Environmental Permitting (England and Wales) Regulations 2007 see: www.environment-agency.gov.uk/epr
35. Remember: the application of organic manures or nitrogen fertilisers on uncultivated land or semi-natural areas may constitute a project under the Environmental Impact Assessment (Agriculture) (England) (No. 2) Regulations 2006. You may need to obtain a screening decision. See GAEC 5 in *The Guide to Cross Compliance in England* for further details.

36. Increasing soil organic matter levels takes time, but in the long term you will reap the benefits through increased productivity, and increased soil workability. In turn, this will help you adapt to the pressures of climate change by helping to improve infiltration, water storage and to help store carbon.

37. You may wish to use the table below to consider how you might maintain and improve soil organic matter on your land. **Please note that this section is optional, and for your own use only.**

Soil Organic Matter Assessment	**Please circle**		**Future Actions –** if in **red**, record any actions that you can do (if applicable and practical), to enhance soil organic matter levels
Take soil tests every 3-5 years including soil organic matter levels?	YES	NO	
Predominantly an arable system on light sandy or peaty soils?	YES	NO	
Straw is chopped and incorporated after harvest?	YES	NO	
Crop rotation includes a grass ley or cover crops/green manures?	YES	NO	
Establish cover crop on land that would be bare over winter. Do this post harvest or by mid September?	YES	NO	
Under-sow spring crops with a cover crop to take up nutrients and provide vegetative cover once spring crop harvested?	YES	NO	
Farmyard manures, slurries or other bulky organic manures such as green waste compost or sewage sludge cake are spread and incorporated?	YES	NO	
Minimum tillage systems are used at some stage during the rotation to protect soil carbon?	YES	NO	
Upland grips have been blocked (following advice) to minimise peat loss in the uplands?	YES	NO	
Careful stock husbandry to minimise overgrazing and poaching is carried out?	YES	NO	
Have entered into an agri-environment scheme such as Environmental Stewardship?	YES	NO	

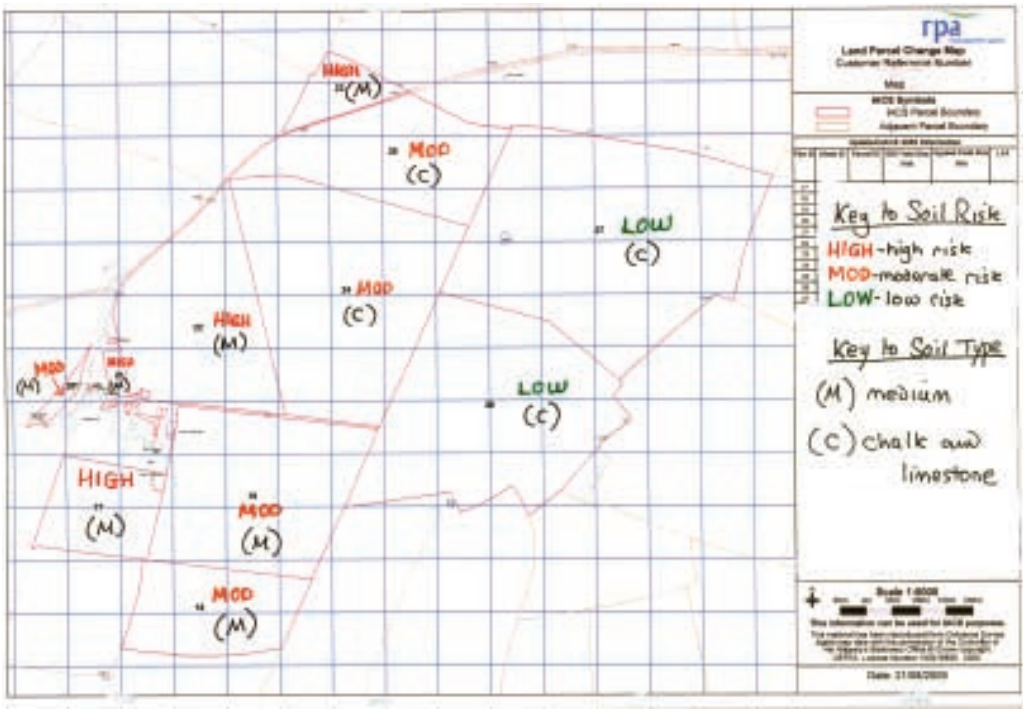
Soil Risk Matrix

38. This matrix shows the potential problems with the various soil types, although these may vary depending on site conditions, location etc. It is provided to help you complete your Soil Risk Record in the SPR, using *either* a Soil Risk Map (see example on next page) *or* a Soil Risk Table (Table B in SPR).
A baseline risk rating has been set based on the general risks for each soil type and you may not classify your field(s) at a lower rating. However, having reviewed the soil issues on your land, you may wish to classify your field(s) at a higher risk rating.
The first column below (replicated in Table A of the SPR) lists the soil concerns that you should consider in assessing the risk classification of your land.
The Matrix shows the general risks for each soil concern under each soil type and will help you determine which concerns pose the greatest risk to your soil type.

Soil Concerns/Soil Type:	**Sandy and light silty**	**Medium**	**Heavy**	**Chalk & limestone**	**Peaty**
Compaction due to cultivations and mechanical damage	HIGH	MODERATE	HIGH	LOW	HIGH
Runoff or water erosion from arable land	HIGH	MODERATE	MODERATE	MODERATE	HIGH
Runoff or water erosion from grassland	LOW	LOW	MODERATE	LOW	MODERATE
Poaching of soil by livestock	LOW	MODERATE	HIGH	LOW	HIGH
Low soil organic matter – as indicated by soils that cap and slump easily or are difficult to cultivate	HIGH	MODERATE	LOW	LOW	LOW
Waterlogging	LOW	MODERATE	HIGH	LOW	HIGH
Wind erosion	HIGH	LOW	LOW	MODERATE	HIGH

BASELINE RISK RATING	**HIGH**	**MODERATE**	**HIGH**	**LOW**	**HIGH**

Soil Risk Record Map



39. This is an example of the type of map you may use to record your soil types for your Soil Protection Review. This example also appears in the SPR. It must be an up to date printed or published map. Photocopies are acceptable but you may not use a hand drawn map.

40. Record risk for each field by marking your map with the following key or alternatively use appropriate colours as on the map.

    SOIL RISK CLASSIFICATION KEY:

    HIGH – High risk
    MOD – Moderate risk
    LOW – Low risk

    S – Sandy and light silty
    H – Heavy
    P – Peaty
    M – Medium
    C – Chalk and limestone

    SANDY AND LIGHT SILTY = High risk (HIGH)

    HEAVY = High risk (HIGH)

    PEATY = High Risk (HIGH)

    MEDIUM = Moderate risk (MOD)
    (unless you choose to classify your field(s) as High risk)

    CHALK AND LIMESTONE = Low risk (LOW)
    (unless you choose to classify your field(s) as Moderate or High risk)

41. When the map is completed it will form a quick reference record of soil risks on your land.

42. Keep a copy of the map with your SPR, for your own use and in case of an RPA inspection.

Principles of good soil husbandry

43. These principles are to remind you of the points you should consider as part of your soil husbandry routine. In addition to these general principles you will find ones which apply to particular types of soils, throughout this guidance. The principles are for guidance only.

General principles of good soil husbandry

i) Prepare and follow a soil management plan and, for cross compliance, complete a Soil Protection Review.

ii) Prepare and follow a nutrient management plan.

iii) Wet soils are more easily damaged by cultivation, harvesting, trafficking and livestock. Timeliness of activities and not overworking soils are critical to maintaining soils in good condition.

iv) Drainage extends the season for field operations and grazing, especially in autumn and spring periods.

v) Soil organic matter improves soil stability and increases workability.

vi) Look at soils during and after rain to identify areas of poor drainage and surface soil stability.

vii) If you have to travel on or work wet soils, reduce the load with low ground-pressure set-ups, or set tyre pressures at the lowest pressure that is compatible with the load and tyre type.

viii) Regular use of a spade to look for any compaction in the topsoil or subsoil helps you make decisions on cultivations, loosening and subsoiling. Deeper cultivation is often needed on tramlines, headlands and gateways to remove soil compaction.

ix) Grow crops that match the capability of the land. When growing crops that require late harvesting, be prepared to correct any compaction or structural problems if they occur. Out-wintering of stock should be carried out on land that has good drainage. Stocking rates should be adjusted to minimise compaction and any runoff to watercourses caused by poaching.

x) Operating machines on sloping ground increases the possibility of overturn and likely injury. When carrying out your soil management planning, it is good practice to consider the limitations of the equipment you have available and avoid unnecessary risks to your safety.

xi) Consider the risks of runoff and erosion when planning what to grow or your stocking on sloping land and which management practices to adopt.

xii) Where severe erosion occurs, earth banks or other physical barriers may be used as a last resort to check the flow of water and reduce off-site impacts. They must be carefully designed and installed.

3 Understanding the management requirements of different soils

44. This section divides soils into five broad groups and describes the characteristics and management requirements of each group. Choose the soil type or types that most closely match the soil(s) on your farm. The broad groups are:
    - sandy and light silty soils;
    - medium soils;
    - heavy soils;
    - chalk and limestone soils; and
    - peaty soils.
45. The Soil Triangle and flow diagram of how to assess the texture of your soils (Appendix 1) can be helpful in identifying the soil types on your farm.

Know the soils on your farm.

Sandy and light silty soils

46. When in good condition, these soils are naturally free-draining and do not remain wet for long periods (unless there is a high water table in the subsoil). There are usually long periods in the year when these soils may be worked without damage.
47. However, their structure is often weak because of the low clay and organic matter content. The soil surface is easily broken up by rain and forms a cap when it dries. The topsoil may fall apart, causing the soil to slump. The soil may then set solid when it dries out.
48. Water gets into soils more slowly if they are capped, slumped or have poor soil structure. This leads to runoff and erosion during rainfall.
49. Although sandy and light silty soils are usually well drained and present good opportunities for land work, they can suffer from compaction – particularly when used to grow vegetable crops. Compaction can be caused by harvesting in wet conditions or by deep cultivation in a wet spring.

50. When they are dry and have little or no vegetation to protect them, these light soils are also prone to wind erosion.

Overworked sandy and light soils can slump following rainfall.

A fine smooth seedbed is vulnerable to capping.

Capping and slumping of the soil increases runoff and soil erosion.

Deep cultivation in spring can compact soft, wet subsoils.

Wind blow on fine dry sandy soil.

Broom's Barn Research Station

Out-wintered stock may cause compaction and runoff.

Earlier drilling of winter wheat on the right-hand side allows better surface cover, which helps to protect the soil.

A coarse seedbed on light soils can help prevent capping. A furrow-pressed coarse seedbed can help prevent wind erosion.

Summary of the main problems associated with sandy and light silty soils

- Low organic matter.
- Capping, surface sealing and slumping.
- Runoff and soil wash.
- Erosion by water and wind.

Principles of good soil husbandry for sandy and light silty soils

3.1 For winter cereals in particular, avoid a very fine, smooth seedbed. A coarse seedbed is less likely to form a cap that will lead to runoff.

3.2 Crop cover protects the soil from the battering action of the rain, and a good root structure holds the soil together. Therefore, sow winter cereals early enough to achieve a good crop cover before winter.

3.3 Correct any deep compaction problems caused by harvesting of potatoes, vegetables and forage crops by subsoiling when conditions are suitable.

3.4 Where it is safe and practical, sow crops and establish tramlines across the slope.

3.5 Sandy and light soils are not well suited to direct drilling because they tend to slump and will need regular loosening.

3.6 Aim to increase the organic matter content and improve the stability of the topsoil by retaining crop residues, by applying manures or by using grass breaks or green manures.

3.7 Avoid growing potatoes, vegetables, maize and other forage crops on slopes if runoff problems are likely to cause soil erosion.

3.8 Avoid out-wintering stock on slopes if runoff problems are likely to cause soil erosion.

3.9 Sow nurse crops such as barley to prevent wind erosion, particularly in vegetable crops or sugar beet grown on unsheltered land that is exposed to strong winds.

Medium soils

51. 'Medium' refers to a range of soils that are widespread across the country. Some of the most productive soils are in this category. Medium soils tend not to lie as wet as heavy soils and in general are at lower risk of structural damage. However, compaction can occur because, although conditions in the topsoil may be suitable, the subsoil may stay wet for longer, particularly where the water table is high or the subsoil is heavier than the topsoil. Timeliness of operations is essential to prevent damage to soil structure.
52. Medium soils contain enough clay to make them stick together, so they are at less risk of capping or slumping after rain. However, those with a high content of silt or fine sand are not as stable, particularly where organic matter content is low, and they may cap.
53. Even on medium soils, capping, compaction or poor drainage can cause excessive runoff leading to erosion, particularly on sloping land in wetter areas of the country.

Landline PR Ltd

Ploughing a wet soil can damage soil structure.

Ploughing at optimum soil moisture levels does not damage soil structure.

A compact subsoil reduces permeability, leading to soil erosion.

Using machinery on wet soil can damage soil structure, causing excessive runoff.

Summary of the main problems associated with medium soils

- Compaction, particularly in the subsoil, from traffic and tillage damage.
- Capping of medium soils that have a high proportion of silt or fine sand.
- Runoff and erosion.

Principles of good soil husbandry for medium soils

3.10 Medium soils are suited to a wide range of crops and grass. Various management techniques can be appropriate, but timeliness is still needed to avoid compaction – particularly in the subsoil.

3.11 Using a plough and press combination can reduce the number of passes.

3.12 Examine soils for structural damage, especially after late harvesting of crops. Plan remedial measures for when conditions are suitable.

3.13 Where it is safe and practical, sow crops and establish tramlines across the slope.

3.14 Where tramlines cause runoff due to reduced infiltration of water, loosen with a tine when conditions allow.

3.15 Medium soils containing a high proportion of silt or fine sand are liable to cap. Avoid this by drilling winter cereals early and ensure seedbeds are left as coarse as possible to encourage infiltration.

3.16 Livestock should be managed to avoid poaching.

3.17 Avoid out-wintering stock on slopes, particularly where poached soil is likely to cause runoff and erosion.

Heavy soils

54. Many heavy soils have a low permeability and are prone to waterlogging and the ponding of water on the surface. They can lie wet for long periods and are susceptible to compaction. Chalky clay soils, which are common in eastern England, are more permeable, easier to work and generally more suited to arable cropping.

55. All operations have to be carefully timed to ensure that soil structure is not damaged by wheelings, tillage implements or trampling and poaching by livestock.

56. The combination of low permeability and compaction can result in surface runoff carrying pollutants (such as fertilisers, manures and slurries, sediment and pesticides) into watercourses. However, this runoff does not usually cause erosion because the clay holds the soil together.

A compacted subsoil can lead to slow drainage.

Compaction and slow drainage can cause runoff on sloping land.

Compaction and slow drainage can cause ponding of water following harvesting.

Land drainage on heavy soils increases the opportunities for timely land work.

Summary of the main problems associated with heavy soils

- Poor drainage and waterlogging.
- Compaction from traffic and tillage.
- Ponding, runoff and soil wash.

Principles of good soil husbandry for heavy soils

3.18 Heavy soils that lie wet for long periods are not suited to crops that are harvested in late autumn/winter, crops grazed late in the season or crops for over-winter grazing, so careful crop selection is needed.

3.19 Using a plough and press combination can reduce the number of passes.

3.20 Heavy soils that are regularly cultivated or intensively stocked often require land drainage to increase the opportunities for working the land or grazing without damaging the soil. Note: natural wetlands should not be drained unless consent has been given under the Environmental Impact Assessment Regulations (see the *Cross Compliance Handbook for England 2010 edition* and *Cross Compliance Guidance for the Maintenance of Habitats and Landscape Features* (GAEC 5) for further information).

3.21 Effective drainage systems often combine moling or subsoiling as secondary treatments over pipe drains that have a permeable backfill.

3.22 Regular maintenance of field drains is essential to ensure that they are working effectively.

3.23 Ditches should be kept clear to help the flow of drainage water. To encourage wildlife, clean the ditches and cut their banks in rotation, and only in the autumn or early winter.

3.24 You should only subsoil when the subsoil is dry enough to shatter and the surface is firm enough for good traction. This will usually be in the autumn. However, poor structure and compaction is easiest to see in the spring, and this is the time that plans should be made for autumn subsoiling.

3.25 Heavy soils are generally not suited to ploughing or other primary cultivation in the spring because subsoils remain wet.

3.26 Stock should be managed to avoid poaching.

3.27 If a pasture has been poached, it may be necessary to reseed the pasture or otherwise loosen the compact topsoil. When reseeding permanent pastures, avoid bringing soil with low organic matter to the surface.

3.28 Avoid spreading manure and slurry when the soil is wet, especially if there is a risk of runoff and pollution.

Chalk and limestone soils

57. Soils over chalk and limestone are often shallow and are mostly free-draining. These soils are usually strong and stable so they do not tend to suffer from capping or slumping. This means there are good opportunities for working the land without causing soil damage.

58. However, runoff and erosion can occur, particularly along compacted tramlines and headlands on steep slopes.

59. Where the topsoil is shallow, it is very easy to dilute it by ploughing or cultivating into the rock beneath. The gradual movement of soil down slopes caused by cultivation (known as tillage creep) can also expose the underlying rock, reducing water retention capacity and yields.

Landline PR Ltd

Chalk and limestone soils are naturally well structured, stable soils.

Runoff can occur on chalk soils from compacted headlands and from tramlines running down slopes.

Landline PR Ltd

Cultivation of thin chalk soils can expose the parent rock underneath.

Work across the slope and turn soil uphill to counter tillage creep.

Summary of the main problems associated with chalk and limestone soils

- Erosion of thin soils due to tillage creep.
- Runoff and erosion on steep slopes, particularly from tramlines and headlands.

Principles of good soil husbandry for chalk and limestone soils

3.29 Avoid deeper ploughing or cultivation into the rock beneath to prevent dilution of the topsoil.

3.30 Working and sowing crops across the slope, where it is safe and practical to do so, can prevent tillage creep, especially if the soil is turned up the slope when ploughing.

3.31 Loosen tramlines to increase infiltration of water when conditions allow.

3.32 When gateways and headlands become compacted, they should be subsoiled when conditions are suitable to achieve good shattering.

3.33 Thin chalk and limestone soils may be suited to minimum tillage.

Peaty soils

60. This group includes peat and organic soils that may be found both in lowland and upland situations. Peat topsoils contain more than 50% organic matter, while organic soils have more than 12%. These soils are widespread in the uplands and are also found in lowland bogs, fens and river valleys. They are intensively farmed in the Fens of eastern England and the Lancashire Mosses.

61. In the Fens and Mosses these soils are very important for arable and vegetable production. They are vulnerable to soil loss by wind erosion because they are light and loose. When drained and cultivated, these soils are vulnerable to 'wastage' by oxidation of the peat.

62. Upland peats are extremely prone to erosion once the vegetation cover is broken and the peat is exposed. This may be caused by overstocking, supplementary feeding, heather burning, vehicle access, drainage or recreational activities.

Barley nurse crops can be sown to protect peat soils from wind erosion.

Broom's Barn Research Station

Sugar beet growing within a sprayed-off barley nurse crop.

Trampling and overgrazing can cause the erosion of peat soils in the uplands.

Dense vegetation can protect sensitive upland soils.

Summary of the main problems associated with peaty soils

- Erosion by water and wind.
- Wastage.

Principles of good soil husbandry for peaty soils

3.34 To avoid wind erosion of fenland soils, sow a nurse crop such as barley, winter rye or mustard, or 'plant' straw to provide shelter. Kill off nurse crops by cultivation or spraying before drilling spring crops.

3.35 Reduce wind blow by planting and maintaining shelterbelts.

3.36 Undrained lowland and upland peat bogs have become increasingly rare and you will need consent under the Environmental Impact Assessment Regulations if you want to bring them into intensive agricultural production (see *Cross Compliance Guidance for the Maintenance of Habitats and Landscape Features* (GAEC 5) for further information).

3.37 Minimise the damage to plant cover on upland peats. Damage can occur through trafficking, overgrazing, supplementary feeding, uncontrolled burning, and putting in drainage channels.

4 The Soil Protection Review Measures

This section outlines the risks to soils when you grow particular crops or use your soils in other ways. Please read the appropriate section for the crops or activities you undertake on your farm. The land use measures also appear in your SPR, where you will be required to choose a selection of them as appropriate in your Farm Soil Plan (Table C).

A Managing soils when growing cereals, combinable crops and grass seed

63. Cereals can have a beneficial effect on soil structure. They can provide a high input of organic matter from deep-growing roots, stubble and chopped straw. Harvesting is normally carried out in dry conditions and crop residues can protect the soil from erosion. They are good at drying out the soil, allowing subsoiling after harvest.
64. On suitable soils, shallow ploughing and cultivation, and non-inversion tillage, retain crop residues near the soil surface, helping to improve organic matter and soil stability.
65. The main risks to soil are:
    - cultivation in wet conditions (either in autumn or spring) potentially damaging structure and leading to erosion;
    - fine smooth seedbeds on soils that are susceptible to capping and slumping;
    - an increased risk of erosion to bare soils following late autumn drilling; and
    - runoff and erosion along tramlines or on compacted headlands.
66. Heavy soils are susceptible to damage from ploughing and cultivating during the spring, when subsoils are generally still wet.

Shallow cultivation in wet conditions can create a tillage pan near the soil surface.

Harrowed sandy soil left over winter without crop cover on steep slopes is vulnerable to capping and erosion.

Stubble and shallow cultivation can protect the soil surface.

Sandy soil under stubble on the left-hand side has slumped. Loosened soil on the right has better drainage.

Soil Guidance Code	Land Use Measures
	Cereals, Combinable Crops, Grass Seed.
	At all times, you must adhere to the Crop Residues (Burning) Regulations 1993
A1	Maintain land drainage. Heavy and medium soils that are regularly cultivated often require land drainage to increase opportunities for working the land without damage.
A2	Where organic matter is low, apply bulky organic manures, compost or digestates.
A3	Where organic matter is low, introduce grass leys into the rotation.
A4	Where organic matter is low, introduce cover crops into the rotation.
A5	Drill autumn sown crops early on soils vulnerable to capping and slumping, drill autumn sown cereals early to ensure a good cover and leave a coarse seedbed.
A6	For winter cereals in particular, avoid a very fine, smooth seedbed. A coarse seedbed is less likely to form a cap that will lead to runoff.
A7	Where it is safe and practical, sow crops and establish tramlines across the slope. If possible do not use tramlines until the spring.
A8	Minimum tillage and direct drilling techniques used.
A9	Where shallow cultivation is carried out, care is needed to prevent soil compaction near the soil surface. Sandy and silty soils benefit from regular loosening.
A10	Before establishing the following crop, remove compaction by loosening the topsoil or subsoiling where necessary, particularly along old tramlines and on headlands.
A11	Other – please state:

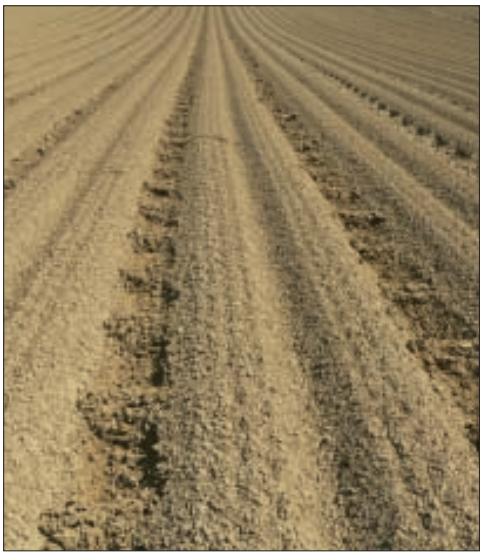
B Managing soils when growing potatoes, sugar beet, salad crops, vegetables and bulbs

67. The main damage to soil from growing potatoes, sugar beet, salad crops, vegetables and bulbs is likely to be caused during harvest in wet conditions. Loaded trailers and heavy harvesting equipment can cause rutting and deep compaction. In wet springs, soil may also be damaged by intensive cultivation when preparing beds and rows.
68. De-stoning soils can damage soil structure, increasing the risk of runoff and erosion. In the longer term, it will encourage the loss of organic matter.
69. Fine, clod-free tilths on sandy and light silty soils, particularly with rows or beds that run up and down the slope, are vulnerable to soil erosion, especially from early summer thunderstorms.
70. Over-application of irrigation water and the use of large water droplets can cap the soil and lead to runoff and erosion, as well as wasting water.
71. Soil structure on headlands, tracks, tramlines and wheelings can be damaged in wet conditions.

Ridges up and down steep slopes with a fine tilth exacerbate soil erosion.

High-rate irrigation with large water droplets can damage soil structure.

Wheel tracks from harvesting brassicas on wet soil can cause deep compaction.



The use of tied ridges helps to stabilise soil and minimise runoff and erosion.

Sugar beet

72. Sugar beet is deep rooting and can dry the soil to some depth, which improves soil structure. Most damage to soil structure occurs from harvesting in wet conditions.

73. Fine seedbeds on peaty soils and sandy soils are at risk from wind erosion in dry conditions. Fine sandy soils are also at risk from capping, soil wash and erosion, especially during early summer thunderstorms.

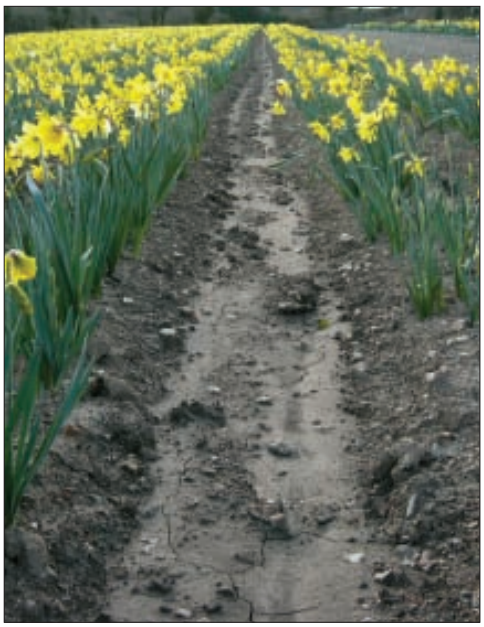
Damaged soil showing ponding of water following harvest of sugar beet.

Sugar beet drilled into a furrow-pressed coarse seedbed can prevent wind erosion on sandy soil.

Bulbs

74. Bulb fields suffer heavy foot traffic and consequent compaction when flowers are picked in winter and early spring. Daily tractor traffic collecting flowers along headlands in wet conditions causes deep wheel ruts, soil compaction, channelling of water, runoff, soil wash and erosion

Frequent tractor traffic in wet conditions during flower picking causes soil compaction.



Foot traffic from flower pickers puddles the soil, damaging soil structure.

Soil Guidance Code	Land Use Measures
	Potatoes, Sugar beet, Salad crops, Vegetables and Bulbs
B1	Maintain land drainage. Heavy and medium soils that are regularly cultivated often require land drainage to increase opportunities for working the land without damage.
B2	Avoid planting on slopes in a way that channels runoff and erosion and/or divide long slopes into smaller units by planting some ridges (beetlebanks) and grass strips across the slope (where safe or practical to do so).
B3	On light soils leave the seedbed as coarse as possible (for example by drilling directly into furrow pressed land or into loosened cereal stubble).
B4	On intensively cropped soils where organic matter is low, apply bulky organic manures, composts or digestates.
B5	On intensively cropped soils where organic matter is low, introduce grass leys into the rotation.
B6	On intensively cropped soils where organic matter is low, introduce green manures into the rotation.
B7	Cultivate headlands and gateways to remove compaction following planting.
B8	Cultivate and plant across the slope where safe to do so.
B9	Use tied ridges and dykes in furrow bottoms to improve infiltration and improve runoff.
B10	Use nurse crops or planted straw to prevent windblow on sandy and peaty soils.
B11	On fields that are vulnerable to compaction, runoff and soil erosion, choose early maturing varieties to allow an early harvest.
B12	Use modular transplants to stabilise the soil.
B13	Site plastic mulch carefully so as to avoid direct runoff into watercourses and roads.
B14	To prevent capping/sealing of the soil and runoff, ensure irrigation is uniform, rates are not too high and droplet sizes too big.
B15	Cultivate the soil as soon as conditions are suitable after harvest, to remove wheelings and compaction.
B16	Following harvest, sow the next crop within 10 days of having been prepared as a seedbed where weather conditions allow.
B17	Rough plough sandy and silty soils following harvest to produce a cloddy coarse surface that is less likely to cap and slump.
B18	Other – please state:

C Managing soils when growing maize and forage crops, including crop residues

74. The risk of damaging soils when growing maize, kale, rape, turnips and fodder beet depends mainly on whether harvesting or grazing is carried out in wet conditions. Maize harvesting in wet autumns can cause deep and severe compaction. Similarly, where root crops are lifted throughout the winter, severe damage from harvesters and loaded trailers can occur.

75. Grazing forage crops and crop residues such as sugar beet tops and brassicas in the autumn or over the winter can lead to poaching, runoff and erosion. Although sheep tend to cause only shallow damage, runoff can be severe.

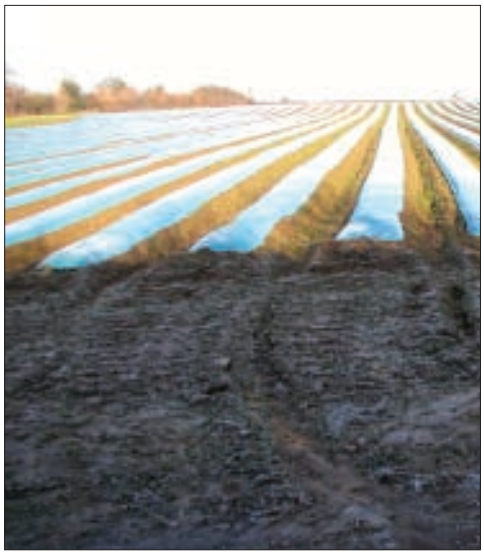
Soil compaction can occur following late harvesting of maize.

Surface pan can be caused by out-wintering of cattle on stubble turnips.

Soil Guidance Code	Land Use Measures Maize & Forage Crops
C1	Maintain land drainage. Heavy and medium soils that are regularly cultivated often require land drainage to increase opportunities for working the land without damage.
C2	On fields that are vulnerable to compaction, runoff and soil erosion, choose early maturing varieties to allow an early harvest.
C3	Undersow maize.
C4	Manage the grazing of forage crops and crop residues to minimise poaching and runoff. This can be done by limiting periods of access, providing run-back areas, strip grazing, cultivating strips across the slope to reduce runoff and by avoiding slopes vulnerable to erosion and runoff.
C5	Where necessary, cultivate as soon as conditions are suitable after harvest or grazing to remove wheelings and compaction.
C6	Rough plough sandy and silty soils following harvest to produce a cloddy coarse surface that is less likely to cap and slump.
C7	Following harvest, sow the next crop within 10 days of having been prepared as a seedbed where weather conditions allow.
C8	The field is sown with a temporary cover crop throughout winter.
C9	Other – please state:

D Managing soils when growing fruit crops (not under polytunnels); hops and vines

76. The main risks to soil from fruit crops occur during planting and harvesting in wet conditions. Wheel ruts can cause deep compaction, runoff and soil erosion. Even repeated foot traffic of fruit pickers can puddle the soil in wet conditions.
77. Wheelings between polythene tunnels or mulches can damage soil structure and, together with the tunnels or mulches, can greatly increase runoff and erosion. Over-application of irrigation water on fruit crops can cap the soil and cause erosion.



Paul Holmes-Ling FWAG

Soil compaction between rows of strawberries and on the headlands can cause runoff and soil erosion.

Paul Holmes-Ling FWAG

Natural regeneration of vegetation and loosening of soil to remove compaction between rows can reduce soil erosion.

Grass strips between cider apple trees helps reduce runoff especially during harvesting and helps to conserve moisture for crop development.

Soil Guidance Code	Land Use Measures
	Fruit Crops (not under polytunnels)/Hops/Vines
D1	Avoid planting in wet conditions.
D2	Plant across a slope where it is safe and practical to do so.
D3	Use a mulch or straw to protect the soil between rows.
D4	Reduce row length by introducing half headlands or trackways so as to minimise excessive travelling during harvesting.
D5	Allow natural regeneration of vegetation, or establish grass between rows of perennial crops to prevent erosion – reseed if damaged during harvesting once conditions allow.
D6	To prevent capping of the soil and runoff, ensure irrigation is uniform, rates are not too high and droplet size is not too big.
D7	Remove compaction between rows using a subsoiler etc.
D8	Other – please state (e.g. picking trains):

E Polytunnels (Field)

78. Owing to the large surface area of plastic, runoff levels are increased and concentrated into small areas. It is important that these channels are managed to improve infiltration.
79. Prior to planting, growers should survey sites and their proximity to watercourses, SSSIs, tracks and roads. Avoid positioning polytunnel rows that flow towards these vulnerable areas and in particular, the close proximity of polytunnels next to water should be avoided.
80. Growers should be aware that one of the most vulnerable times for runoff and soil erosion is during bed establishment and during the installation of black plastic. The installation of swales and check dams (stone) and sediment ponds at the end of rows can significantly help to trap sediment and runoff while maintaining row access.
81. Headlands, trackways and inside tunnels are often at a high risk of compaction due to trafficking pressure from pickers and machinery. Where this does not impede walking conditions, compaction should be remediated or prevented so as to reduce unnecessary runoff.
82. On headlands, temporary trackways can be constructed which will reduce soil erosion and allow easier crop removal with minimal soil onto roads.
83. You should follow the Polytunnel Code of Practice www.nfuonline.com/x3775.xml produced by the NFU and British Summer Fruits Association when siting polytunnels.

Natural England

Swales and check dams below strawberry beds catch and slow down runoff and improve condition of tracks.

Soil Guidance Code	Land Use Measures
	Polytunnels (field)
E1	Construct temporary trackways.
E2	Use of field scale gutter systems to capture runoff.
E3	Capture runoff from polytunnels and divert away from headlands and travelled areas.
E4	Minimise runoff from tunnels by collecting into sediment ponds.
E5	Ensure irrigation is uniform.
E6	Cover leg row soil with geotextile material or sow with grass or cereals in wider rows after bed making and prior to tunnel skinning.
E7	Use mulch or straw to protect between polytunnels.
E8	Shorten row lengths with intermediate ditching to reduce runoff velocity.
E9	Plant grass buffers of at least 10 metre width to buffer headlands. Do not travel on these buffers.
E10	Remove compaction after polytunnel plastic is removed.
E11	Other – please state:

F Turf Production

84. Turf production, if sited and carefully planned during lifting, is often a low risk activity. Care and attention must be taken during sowing and during turf lifting particularly where the risk of runoff and wind erosion is a problem.

85. Rough cultivation or sowing another crop or temporary cover crop when conditions allow, is important to help stabilise the soil after turf lifting.

Turf Growers Association

Low pressure tyres help displace weight and are essential for producing high quality turf.

Turf Growers Association

After lifting turf, remove compaction when conditions allow, to prevent runoff.

Soil Guidance Code	Land Use Measures
	Turf production
F1	Maintain land drainage to increase opportunities for working the land without damage.
F2	Avoid planting in wet conditions.
F3	Drill autumn sown crops early on soils vulnerable to capping and slumping, and to ensure good cover before winter.
F4	Use slurry or irrigation water on seedbeds to prevent windblow on sandy and peaty soils.
F5	Ensure irrigation is uniform, rates are not too high and droplet sizes too big.
F6	Remove compaction after turf lifting through subsoiling, ploughing etc.
F7	Other – please state:

G Outdoor pigs and poultry

86. Pigs can cause severe trampling and compaction of the topsoil, and trackways used by vehicles can become deeply rutted. Where pigs are kept on slopes, problems of runoff and erosion can occur. Problems will increase the longer pigs are kept on the same area of land.

Outdoor pigs can damage soil structure, causing excessive runoff and soil erosion on slopes.

Keeping outdoor pigs on grass can reduce soil erosion.

Outdoor Poultry

87. Outdoor poultry is often regarded as a low risk activity if managed correctly. However, poaching and high nutrient concentration can be a particular problem if outdoor sites are not moved regularly. It is recommended that poultry is moved between fields regularly and that compaction and bare earth is cultivated and reseeded to maintain a stable vegetated cover.

Moving poultry between fields regularly helps to minimise the impact and ensures a continuous grass cover is provided.

Soil Guidance Code	Land Use Measures Outdoor Pigs & Poultry
G1	Employ a BPEX Soil Management Plan.
G2	Plan and manage paddocks and tracks to avoid channelling of water.
G3	Ensure field grass cover is well established at least 12 months before the pigs are introduced to the land (i.e. so root structure is well developed and have a good established grass sward before the pigs arrive). Choose deep rooted varieties of grass that are drought resistant.
G4	Develop a rotation so that pigs and poultry can be moved on to grass and the sward can be maintained.
G5	Locate grass strips to restrict runoff – it is good practice to establish grass buffers to intercept run-off, but these should in addition to the points above and must not be relied on to prevent off-site impacts.
G6	If problems of runoff and erosion occur, move pigs from the area and cultivate as soon as possible.
G7	When the pigs have been moved onto another paddock, loosen the compacted soil or cultivate and reseed as soon as possible.
G8	Reduce stocking densities on individual fields.
G9	Other – please state:

H Short rotational coppice, Miscanthus and rhizome products

88. Short rotation coppice (SRC) and Miscanthus can benefit the soil by adding organic matter, resisting erosion through the binding effect of the dense root system, and providing a good cover of the soil surface.
89. The main risks to soil from these crops are structural damage during harvest (including that of Miscanthus rhizomes) in wet conditions and subsequent erosion.

Harvesting Miscanthus rhizomes during winter can damage soil structure.

Harvesting Miscanthus canes late in the season during dry conditions prevents damage to soil structure.

Soil Guidance Code	Land Use Measures
	Short Rotational Coppice, Miscanthus & Rhizome Production
H1	When growing, particularly for rhizome production, cultivate and plant across the slope where safe to do so.
H2	Harvest during dry conditions to avoid soil compaction.
H3	Avoid harvesting Miscanthus before it is mature (early in the season) if this would damage wet soil.
H4	Use Miscanthus as a mulch in gateways if required during harvest.
H5	Use well established tracks when travelling across adjacent fields during harvest.
H6	Following harvest, cultivate or loosen the soil to remove compaction, paying particular attention to tracks, headlands and gateways.
H7	When harvesting for rhizome production, cultivate the soil as soon as conditions are suitable after harvest to remove wheelings and compaction.
H8	When growing particularly for rhizome production, cultivate and plant across the slope where safe to do so.
H9	After harvesting rhizomes, sow with the next crop or temporary crop cover.
H10	Other – please state:

I Managing soils under improved grassland (including equine)

90. Grass can improve soil structure due to its dense network of fine roots and high input of organic matter. Nevertheless, grassland soils are prone to damage from working the land and grazing when the soil is too wet. High-risk activities are:
    - silage-making with heavy loaded trailers;
    - spreading manure and slurry in wet conditions;
    - grazing when the soil is too wet, particularly when using a strip system;
    - out-wintering of stock;
    - reseeding grassland; and
    - not moving supplementary feeders often enough.
91. Structural damage may cause runoff and erosion may follow, depending on the circumstances.

Compacted grassland can suffer from ponding and runoff.

Slurry spreading on wet soil can damage soil structure.

Soil Guidance Code	Land Use Measures Improved Grassland (including equine)
I1	Maintain land drainage systems to reduce the risk of damaging soil structure under wet conditions (for example when cutting silage).
I2	Use well drained tracks for vehicles and livestock.
I3	Minimise damage to riverbanks by providing managed access to water for livestock.
I4	Remove sward compaction through subsoiling with a grass subsoiler, tines or spikes.
I5	Regularly move ring feeders or place feeders and troughs onto a stone base.
I6	When re-seeding grass, sow early enough to achieve a good cover before winter. Aim to create a coarse seedbed that is less likely to form a cap that will lead to runoff.
I7	Remove grazing livestock from the grassland when the soil is too wet and poaching occurs. Ensure there is enough shelter for livestock in areas where the soil is wet for long periods.
I8	If it is necessary to out-winter stock, locate any sacrificial fields on freely drained soils and not on fields that will lead to erosion. Cultivate and re-seed in the spring to remove any compaction.
I9	Other – please state:

92. Grass subsoiling can help to extend the grazing window by helping to remove compaction, improve drainage and help improve grass growth. Please be careful not to damage any below ground archaeology through subsoiling. If below ground archaeology has been specifically identified, avoid subsoiling.

J Managing soils under natural and semi-natural grassland and vegetation (including equine)

93. Damaging the ground cover provided by natural and semi-natural grassland can lead to runoff and soil erosion in both the uplands and lowlands. When vegetation cover is lost on upland peats soils, rapid and damaging erosion can occur. Manage vegetation and livestock, vehicle and human access to maintain the ground cover.

Sheep 'scar' caused by trampling and scraping by sheep

Sheep 'scars' joining together to cause accelerated upland sheet erosion.

Soil Guidance Code	Land Use Measures
	Natural and Semi-natural Grassland and Vegetation (including equine)
J1	Adjust stocking rates to ensure that overgrazing does not result in loss of vegetation cover (GAEC 9).
J2	Shepherd the stock to prevent overgrazing in localised areas.
J3	Install and maintain tracks to minimise run-off.
J4	Minimise the need for vehicle use and use low ground pressure machinery when conditions require, keeping to established tracks and paths as far as possible.
J5	Undertake all supplementary feeding on ground away from sensitive vegetation and move the feeding sites as necessary to avoid breaking the soil cover, keep supplementary feeding away from watercourses. (See also GAEC 9).
J6	Avoid burning on blanket bog and deep peat where erosion can be serious. You must also meet the requirements relating to heather and grass burning (GAEC 10), and if your land lies within a Site of Special Scientific Interest you must also take account of GAEC 6.
J7	Avoid leaving bare soil during bracken management on sites with a risk of erosion.
J8	Minimise damage to riverbanks by providing managed access to water for livestock.
J9	Other – please state:

K Managing soils under other land uses e.g. flowers (not bulbs), herbs, nurseries, pharmaceutical crops etc.

94. Additional care must be taken with nurseries to avoid runoff and its potential to carry spray residues and nutrients. This excess runoff water where concrete and glasshouses are used can be conserved and stored to help irrigate crops.
95. Where crops such as trees are lifted in the winter, it is important to prevent runoff and soil erosion by taking appropriate post harvest management when conditions allow, such as rough ploughing, sowing/planting the next crop, or by sowing a cover crop.
96. Where crops are being harvested by hand, surface compaction can occur from regular hand picking. Where hand picking takes place, plant crops so that they are not channelling runoff towards watercourses and roads, and if fields are large and sloping, crops should be ideally split up by planting grass strips.

Soil Guidance Code	Land Use Measures
	Other Land Use Types e.g. Flowers (not bulbs), Herbs, Nurseries, Pharmaceutical Crops, etc.
K1	Maintain land drainage systems to reduce the risk of damaging soil structure under wet conditions.
K2	Avoid planting in wet conditions.
K3	Avoid planting on slopes in a way that channels runoff and erosion and/or divide long slopes into smaller units by planting some ridges (beetlebanks) and grass strips across the slope (where safe or practical to do so).
K4	Increase organic matter.
K5	On intensively cropped soils where organic matter is low, introduce green manures into the rotation.
K6	Use bed systems to reduce wheeled area.
K7	Site plastic mulch carefully so as to avoid direct runoff into watercourses and roads.
K8	Ensure irrigation is uniform, rates are not too high and droplet sizes too big.
K9	Harvest during dry conditions to avoid soil compaction.
K10	Sow the field with a temporary crop cover throughout winter.
K11	Other – please state. (You may wish to look at required measures for other activities to apply to your individual circumstances).

L Managing soils on land not in agricultural production (GAEC 12) or used for non-agricultural activities

97. It is important that soils are protected on land that is not in agricultural production.
98. On sites where organic matter is low, a green cover established by seeding can help build up organic matter ahead of a possible return to production.
99. The main risks to soil are:
    - runoff and erosion from land where a green cover has not established satisfactorily;
    - reshaping of the land surface, for example for motor sports activities;
    - the soil becoming eroded, rutted or compacted by vehicles, including car parking or access, or being poached by animals, for example by equestrian activities;
    - erosion, especially on high-risk sites, if heavy rain follows summer cultivation; and
    - a failure to maintain drains and ditches leading to waterlogging and slow drainage.

Use temporary tracking to prevent rutting and compaction in car parking areas.

Soil Guidance Code	Land Use Measures
	Agricultural land not in agricultural production or used for non-agricultural activities
L1	Maintain land drainage systems to reduce the risk of damaging soil structure under wet conditions.
L2	Maintain vegetative cover.
L3	On land at high risk, establish a green cover by re-seeding.
L4	Where soil organic matter is low, establish a green cover by re-seeding.
L5	Avoid travelling on land using heavy machinery.
L6	If any activity causes ruts or compaction, cultivate and reinstate green cover.
L7	Restrict reshaping of the land surface or the repeated passage of vehicles.
L8	Other – please state. (You may wish to look at required measures for other activities to apply to your individual circumstances).

5 Managing your soils under Environmental Stewardship

100. If you are not in an agri-environment scheme such as Environmental Stewardship, you should consider joining since some of the scheme options available will help you with your soil management.

101. Environmental Stewardship (ES) provides funding to farmers and other land managers in England who deliver effective environmental management on their land. The scheme builds on the recognised success of the Environmentally Sensitive Areas and Countryside Stewardship Schemes.

A grass buffer strip at the bottom of a slope helps reduce runoff.

Steep and awkward field corners are suited to arable reversion.

102. Both Entry Level and Higher Level Stewardship contain options that can be used to help protect soils. These are intended to reduce off-site impacts by protecting watercourses and natural habitats and by stopping soil washing onto roads and neighbouring properties. The specific soil related options are as below:

Further information (including application details) are available at: http://www.naturalengland.org.uk/ourwork/farming/funding/es/default.aspx or contact your local Natural England office (0845 600 3078).

ELS options (to help reduce soil erosion and runoff) that have direct benefits for reducing soil erosion and runoff include:

- managing maize;
- winter cover crops;
- in-field grass areas to prevent erosion and runoff;
- creating buffer strips alongside watercourses;
- planting beetle banks;
- managing hedgerows

HLS options (to help reduce or prevent soil erosion and maintain and/or increase organic matter):

- reversion of arable land to grassland with no fertiliser or low fertiliser input; and
- in grassland systems:
  - managing improved grassland; and
  - a supplement for removing livestock in winter or summer

6 Buffer strips to protect water – Advisory Guidance

Why are buffers important?

103. As a farmer or land manager, you will know that some of your day to day farming activities, if not done carefully, can damage the quality of water in ponds, lakes, rivers, streams or ditches on or near your land. You therefore have a vital role in protecting water. Your careful management can help prevent sediment, nutrients, bacteria, pesticides and other pollutants from reaching the water, which can reduce water quality and be harmful to aquatic life.

104. One fairly simple way of protecting water from potentially harmful farming activities is creating a network of grass strips along riverbanks, streams, and ditches (known as riparian buffer strips). This will provide a buffer between agricultural operations and water.

> The EU Water Framework Directive sets challenging targets for the protection of water resources. In order to minimise the need for future regulation to meet these targets, Defra is strongly encouraging farmers to consider placing buffer strips next to vulnerable watercourses. Advice on locating and managing buffer strips is available from Catchment Sensitive Farming Officers, Natural England Advisers, Campaign for the Farmed Environment and other farm advisers. Payments for buffer strips are available under Entry Level Stewardship (ELS) – details on how to find out more about ELS are given in the 'further information' section at the end of this document.

Buffer strips and water quality

105. Riparian buffers are areas of vegetation (usually grass) next to watercourses which provide a physical barrier that helps trap pollutants such as sediment, nutrients, bacteria and pesticides and prevent them from being washed from field to watercourse.

Photo 1: Recently established buffer strip in the Cotswolds, created for the protection of spring water. (Copyright:Haycock Associates, 2009).

What does a buffer strip do?

A riparian buffer strip is a rough grass strip next to a watercourse that:

- slows surface water runoff and so encourages silt to be deposited, which helps reduce the amount of sediment and soil bound pollutants entering watercourses
- helps the soil to absorb surface water runoff and dissolved pollutants before these can reach watercourses
- Dense vegetation such as thick grass makes buffer strips more effective at controlling sediment and water runoff.

Buffers can also help to stabilise the banks of watercourses and reduce the need for ditch maintenance by reducing the flow of sediment into the ditch.

However, please bear in mind that riparian buffer strips are usually the final line of defence where other measures to prevent erosion and runoff – such as good soil management – have not solved the problem.

What is the best width for a buffer strip?

106. Generally speaking, the wider the buffer, the better the protection for watercourses. But current evidence shows that the minimum effective width for farmers is six metres (including your 1m – 2m cross compliance protection zone required under GAEC 14). This gives the maximum protection for the minimum amount of land taken out of production. For this reason, a buffer of at least six metres is recommended.

107. Under Entry Level Stewardship (ELS) there is a range of buffer strips for which you can be paid. These are designed to deliver a range of different environmental benefits, such as creating new wildlife habitats, forming links between areas of wildlife habitat, or protecting archaeological features: to achieve the maximum benefit next to water, however, the recommended width of ELS buffer is 6m, measured from the edge of the 1m-2m GAEC 14 protection zone. The payment for this buffer is £400/ha.

Where should I put buffer strips on my farm?

108. *Riparian buffer strips should be located carefully in the landscape so that they are effective. The following sections give guidance on what you need to think about when locating buffer strips on your farm.*

Where does surface water runoff occur?

109. Your own knowledge of the land, especially knowing where the water flow is heaviest, particularly after extreme rainfall, is the best way of identifying where riparian buffer strips will be most useful. It is important to know where water flows through fields and ponds before entering watercourses and which ditches silt up most frequently. This will be most obvious after periods of extreme rainfall. The following sections explain this in more detail.

Photo 2: Arable land displaying runoff, erosion and sediment transfer (River Rother catchment, Sussex (Copyright: Haycock Associates, 2000)

What types of watercourses are best suited for buffer strips?

110. Buffer strips should be used to protect:
    - Springs
    - Headwater streams
    - Ditches
    - Streams
    - Brooks
    - Temporary watercourses

111. These watercourses are where most surface water collects and then flows into larger rivers. Placing buffers alongside these smaller water courses is the best way to improve the water quality of larger rivers and channels. Headwater streams are an important habitat for wildlife and provide nurseries for the majority of our juvenile fish. The quality of these habitats is therefore fundamental to the fisheries of our larger streams and rivers.

112. Temporary watercourses (e.g. ditches and streams that are not permanently wet, but may carry water during times of high rainfall such as in the winter, or after a summer storm) will also benefit from the use of buffer strips.
113. Roads that act as temporary watercourses during storms, where the road is the only effective drainage route for a field, may require a buffer strip. This is an important factor in chalk landscapes such as in the South of England.
114. Land with outdoor pigs has the potential to become poached and damaged, which can lead to runoff and soil erosion problems. If you have outdoor pigs near a watercourse, buffer strips can be an effective way of preventing soil and nutrient loss into the water.
115. Buffer strips can also be effective in helping to protect and maintain good water quality in larger rivers.

How does my soil type affect the location of buffer strips?

116. Riparian buffers are best suited to assisting the control of runoff on sandy and light silty soils, medium and chalk and limestone soils.

What if I have heavy or peaty soil?

117. Buffer strips are often less effective for these soil types. The small soil particles tend to flow with water over the surface of the buffer strips into watercourses. If you have heavy soils you should consider alternative management options from your Soil Protection Review. You may also want to consider joining Environmental Stewardship, where you can receive payment for putting in place management options for protecting water.

Do I still need buffer strips if the land is already well drained?

118. Even on under-drained land where the majority of the water will by-pass the buffer strip, installing buffer strips should still be considered to prevent sediment entering water courses if runoff occurs when these soils are saturated.

On what gradient of slope are buffer strips most effective?

119. Riparian buffer strips should be established where field slopes next to a watercourse range from:
    - 2° – 11° on sandy and light silty soils
    - 2° – 7° on medium and chalk and limestone soils

What if I have a steep sloping field?

120. If slopes next to the watercourse are steep (more than 7˚ on medium, chalk and limestone soils and more than 11˚ on sandy and light silty soils) water runs more quickly over the surface of the land, bringing with it soil, nutrients and pesticides and a 6 metre vegetated buffer strip does not have the capacity to slow down or filter pollutants or catch the sediment. We advise you to seek alternative management options from your Soil Protection Review. Alternatively you should consider joining Environmental Stewardship, where you can receive payment for putting in place suitable management options for protecting water.

How do I measure slopes?

121. To measure the slope of your land you can:
    - View slope information about your holding online using the Whole Farm Approach (available during 2010);
    - Seek advice from your local Catchment Sensitive Farming Officer or farm adviser;
    - Use a clinometer or other technique to estimate the slope of your land yourself.

What if the landscape of my fields is complex?

122. Smaller "dry valley" depressions that feed into a watercourse can generate considerable water flow at times of high rainfall, which can overwhelm riparian buffers.

123. In these situations, it's worth considering:
    - a buffer strip in the base of the dry valley (which is often saturated land and may be difficult to farm), or
    - widening the buffer strip where the dry valley meets the water course

124. Deciding what to do in these complex situations will often be quite difficult and it's worth talking this through with your local Catchment Sensitive Farming Officer or your farm adviser. You may also want to consider joining Environmental Stewardship, where you can receive payment for putting in place suitable management options for protecting water, including buffer strips.

How do I establish and manage a buffer strip?

125. *This section provides information on establishing and managing buffer strips. Further detailed information on the establishment and management of buffer strips is set out in the ELS handbook, available from the Natural England website (www.naturalengland.gov.uk).*

Principals of good buffer strip creation

126.
- Establish a dense grassy buffer strip next to watercourses either by natural regeneration or sowing. Dense grassy buffer strips will provide vegetation cover to intercept surface runoff all year round.
- Remove any compaction from the topsoil and any rills or gullies during seedbed preparation unless archaeological features are present. If you have an ELS agreement, archaeological features will be marked on your Farm Environment Record/Environmental Information Map.
- Avoid using heavy equipment during seeding, especially near the top of the stream bank as this could collapse the bank. Heavy equipment can also cause compaction of the soil under the buffer strip, which will reduce its ability to absorb water.
- Regular cutting (2-3 times) in the first 12-24 months may be needed to control annual weeds and encourage grasses to tiller (this is permitted under GAEC 12 if you are establishing a buffer strip).

Principles of good buffer strip management

Things to aim for

- Aim to create a dense grass sward which is capable of slowing the passage of water from the adjoining field into the watercourse. Density of grass is important to slow the flow of water. Over time, silt will accumulate within the buffer strip, but if the grass is not smothered, vegetation growth will root into this silt and incorporate it into the soil over time.
- Apply herbicides only to spot-treat or weed-wipe for the control of injurious weeds (i.e. creeping and spear thistles, curled and broadleaved docks or common ragwort) or invasive alien species (e.g. Himalayan balsam, rhododendron or Japanese knotweed).
- To be most effective, you will need to maintain a thick grass cover. Maintaining this cover during winter and spring is particularly critical since this is the period when surface runoff and erosion from adjoining fields is most likely to occur.

Things to avoid

- Try to avoid compaction and poaching as this effects the capacity of the buffer to absorb water. Avoid cutting when soils are wet to prevent compaction. Do not use riparian buffers for regular vehicle access, turning, livestock movement/grazing or storage. Travelling across buffers should be limited to dry periods when the risk of compaction is reduced.
- Avoid excessive grazing pressure (e.g. rabbits / deer / invertebrate infestation)
- Do not cut before August to avoid disturbing ground nesting birds.
- Do not apply fertilisers or manures at any time.

Riparian buffers with good vegetation cover (copyright: ADAS, 2009).

How do I ensure my buffer strips are working?

127. Once you have established your buffers, they will need careful management to maximise performance. You should regularly inspect your buffers and take corrective action when you spot any problems.

128. *Ideally, inspections are best done during or immediately after heavy rainstorms so you can see where surface runoff is occurring.*

- Well maintained buffers need to be used in conjunction with good soil management to maximise environmental benefits. Maintaining good soil structure on agricultural land next to the buffers is important.

Buffers represent the last line of defence for streams and ditches so think about how you can tackle problems at source and/or better manage the pathway of any water flow from the field.

What problems should I look for and what should I do?

Breaching

129. *Breaching is where the flow of water has overwhelmed the buffer strip and begun to form channels, which reduces the effectiveness of the buffer strip.*

- Look for evidence of breaching where rills or gullies have formed across the buffer strip.
- Examine what has caused the breach, and either:
  a. undertake field management measures that will remove compaction and increase infiltration such as sub-soiling after harvest, leaving rough seedbeds or taking steps to increase soil organic matter, which will help to reduce the formation of gullies, or
  b. if a minor gully, fill in the gully and consider widening the buffer strip – a wider 12 metre buffer strip can be funded under Entry Level Stewardship (ELS) (details on how to find out more about ELS are given in the 'further information' section).
- Look for evidence of prolonged pooling of water within the buffer strip, which can damage soil and vegetation. To correct this, you may need to widen and re-establish the buffer – ELS buffers can be helpful here (details on how to find out more about ELS are given in the 'further information' section).

Photo: Example of concentrated flow and breach of a buffer strip in Sussex (Copyright: Haycock Associates, 2009).

Silting up of buffers

130. ■ If excessive silt deposits smother and reduce growth of the grass, the silt should be carefully removed from the buffer strip and returned to the adjoining field. The buffer strip should be re-established as necessary.

■ To prevent excessive silting up the strip may need to be widened in the problem area (an ELS margin could be helpful here (see 'further information' section) and you may need to review your field practices to reduce erosion and avoid build up of sediment in future.

Silting up of water courses

131. ■ If the watercourse becomes silted despite the establishment of the buffer strip, consult your Natural England adviser, Catchment Sensitive Farming Officer or farm adviser for further guidance on which measures to take.

■ If removing the silt, do not place spoil/risings on the buffer strip. If removing silt from a ditch, and you have an ELS agreement, check to see whether management is part of your agreement – specific rules will apply to the type and frequency of management.

Culverts

132. *A culvert is a sub-surface drain that channels a water course under a road or other feature.*

■ In a storm, culverts often do not cope with all the storm water and temporary channels form on the soil surface over the culvert. This temporary channel is likely to require a buffer strip. Current legislation does not permit the culverting of watercourses without the consent of the Environment Agency.

Compaction and poaching

133. ■ If compaction occurs, due to the passage of farm vehicles, livestock, public events etc, the best way to put this right is by shallow sub-soiling (But if it is an ELS buffer please speak to your Natural England adviser before doing so).

■ You will also need to think about any buried archaeology protected under GAEC 7 (if you are in ELS these should be marked on your Farm Environment Record/Environmental Information map).

Vegetation problems

134. ■ Excessive grazing (rabbits/deer/invertebrate infestation) will require management and corrective action.

■ Wider buffers strips (available as an ELS option) can be helpful where the grazing pressure is high. You should take advice on placement of wider buffer strips and details on how to find out more about ELS are given in the 'further information' section below.

What else can I do?

Buffer strips do not avoid the need for good soil management in order to prevent excessive surface water runoff and erosion.

135. Even if you have established buffer strips on your farm, poor land management and the associated runoff from this land can sometimes overwhelm a buffer strip. If this happens, you must review your soil management to see how you can stop it happening again. Buffer strips are not the sole answer, but part of a range of tools to protect and maintain water quality. With this in mind, implementing preventative measures such as good soil, fertiliser and pesticide practices will always be the first step in controlling pollution.

Buffer Strip Case Study: Stetchworth Estate Farms, Suffolk

136. Stetchworth Estates farm approximately 1,420 ha near Newmarket on the border of Suffolk and Cambridgeshire. The farm has been using buffer strips adjacent to watercourses, hedges and archaeological features for over a decade. Ron Gabain, estate manager, believes they are an important part of the farm's management of arable cropping, wildlife habitats and soil and water.

The farm has 6 metre buffers along both sides of most ditches, and will be giving consideration to extending them when the ELS agreement is due for renewal in 2011.

137. The farm produces spring and winter malting barley, winter and occasionally spring wheats, winter beans and sugar beet. The land, which is fully drained, is approximately one third heavy Hanslope series soils over chalky boulder clays, and two thirds light to medium loam over chalk. The farm has a number of ditches in the heavier land and one main drainage ditch on the lighter land.

Buffers located alongside this ditch will trap sediment from the sloping fields on either side, which are part of the sugar beet rotation. Buffers are an additional defence against soil movement and physical drift of carefully applied inputs.

138. The farm takes water and habitat protection very seriously, and estimates that 90% of its ditches are buffered with 5 metre strips in addition to the cross-compliance requirement under GAEC 14 (i.e. 5m + 1m = 6 metre buffers).

139. Buffer strips were first created under the Arable Stewardship Pilot Scheme in 1997; they were sited to buffer SSSIs and to create wildlife corridors and nesting habitats. Additional buffers were introduced through Countryside Stewardship and ELS. 4 metre buffers options were chosen but were drilled with a 6 metre drill to allow for cross-compliance and some room for error with ploughing on the field side.

140. Riparian buffer strips on the farm were first established in Autumn 2005 by ploughing after harvest and drilling grass seed. The mix used was a "basic set aside mix" containing less aggressive grasses such as meadow grass, fescues, timothy and creeping bent. The farm began to see buffers as a management tool for dealing with watercourse protection and specifically the LERAP requirements, as opposed to solely for wildlife habitats.

141. 

Ron feels that the best establishment is achieved by drilling a selected mix and establishing a good sward, with regular cutting in the first year (and as often as possible in the first summer). After establishment, the buffers at Stetchworth have required very little management although thistles and any scrub are cut and ragwort is hand-pulled as required. The estate cuts buffers before ditches are trimmed to allow for better recovery. Members of the public are discouraged from walking on the buffers and a

notice near the road or adjoining footpath has proven to be the best way to keep walkers out of the buffers.

142. The farm has not experienced weed problems since establishing the buffer strips. Ron puts this down to having a good, dense grass sward. Problem weeds such as brome, black grass and cleavers will not compete with this type of grass sward and as such he has not had problems with weeds moving from the buffers into the crop. The advice from Stetchworth is to keep nutrients out and to avoid bare patches that can occur if machinery runs or turns on the buffers.

The farm is committed to preserving the living environment and uses buffers as a tool to protect trees such as these oaks, and to provide nesting habitat for game and wild birds, as well as protecting the watercourse from soil and associated pollutants.

143. Stetchworth Estate Farms pay close attention to good soil management in order to reduce runoff and leaching. Cultivation practices are carefully selected and techniques to improve soil organic matter content, such as green manure crops, are used. However, there are times when it is difficult to make all recommended practices fit the system. Ron does not drill sugar beet across a slope due to the difficulty with harvest and views buffers as an important tool for this crop to trap any soil movement.

144. Ron feels that the ELS payments are good compensation for lost crop. Admittedly there has to be an edge to the crop somewhere, but work on sugar beet showing a 20% yield loss at the edges has convinced the farm that the returns from environmental payments compensate for lost gross margin. The farm takes the view that they grow a permanent crop of grass that is cheap to establish and doesn't need to be harvested, but makes a set return year on year.

Further Information

Further information about how to apply for an ELS agreement:

Natural England offers training and information to farmers and land managers on ELS and Organic ELS. Farm based group events and farm specific one to one visits are available free of charge. This training gives information on applying for ELS, how to choose and locate the right options on your farm and how to effectively manage the options over the agreement period. Call our events team to find out what advice is available in your area on **0300 060 1695.**

Or visit: http://www.naturalengland.org.uk/ourwork/farming/landmanagementadvice/events/default.aspx

Further guidance on buffer strips:

Detailed information on the creation and establishment of buffer strips is in the ELS handbooks:

http://www.naturalengland.gov.uk/Images/NE%20ES%20ELS_tcm6-6505.pdf

and:

http://www.naturalengland.gov.uk/Images/ELSoptions_tcm6-10718.pdf.

To understand the threats to the aquatic environment on and around your farm, including the main threats to water quality in your area, you can check available information on the Environment Agency Website. The 'what's in your backyard' pages detail local information based on your postcode.

http://www.environment-agency.gov.uk/research/library/data/34383.aspx

Further information on soil management and assessment in relation to diffuse pollution can be found in the ThinkSoils handbook which you can order from the Environment Agency website

http://www.environment-agency.gov.uk/business/sectors/soils.aspx.

If you farm is in a Catchment Sensitive Farming (CSF) priority area, further advice on using riparian buffers can be sought from your local Catchment Sensitive Farming Officer:
http://www.defra.gov.uk/farm/environment/water/csf/

Information on the Campaign for the Farmed Environment (CFE) is available online at www.cfeonline.org.uk or by contacting the CFE on cfeonline@nfu.org.uk or 024 7685 8536

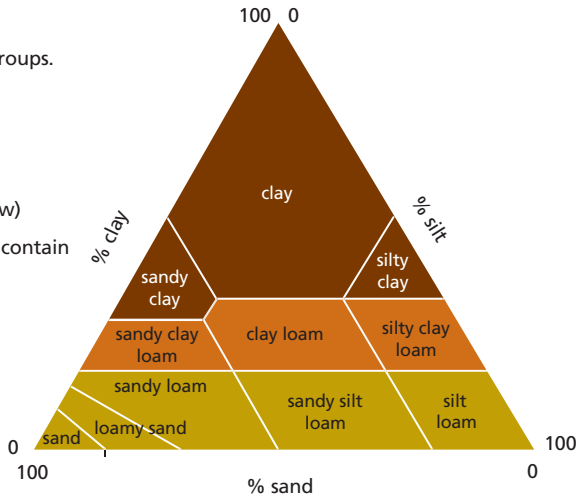
Information on Local Environment Risk Assessment for Pesticides (LERAP) requirements is available from:
http://www.pesticides.gov.uk/safe_use.asp?id=207

Appendix 1

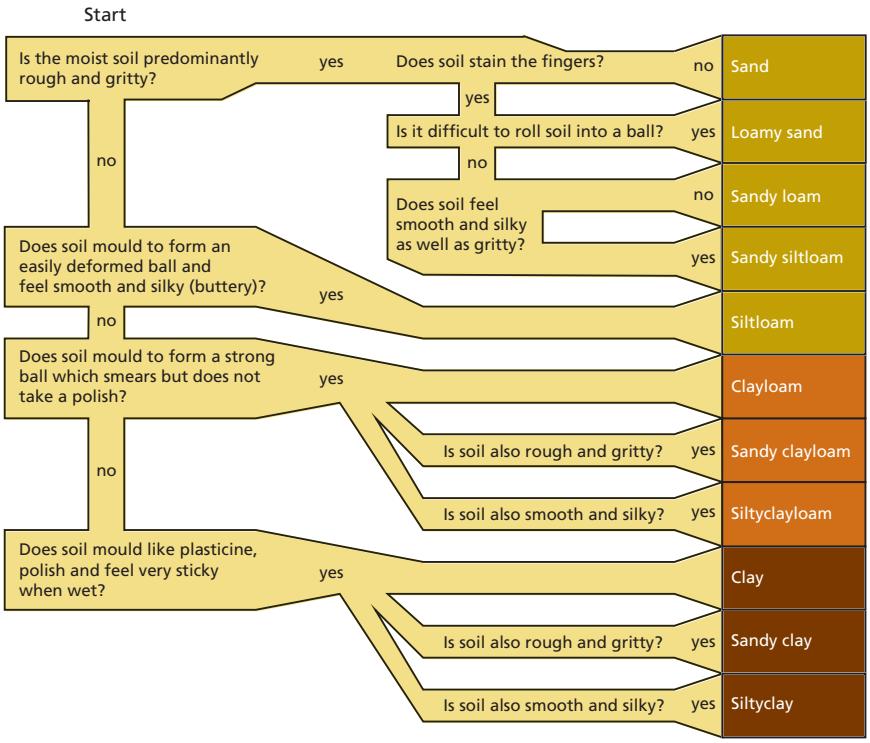
Soil triangle

Identification of soil group
Soil can be placed into one of five broad groups.

- Sandy and light silty soils (see triangle)
- Medium soils (see triangle)
- Heavy soils (see triangle)
- Chalk and limestone soils (often shallow)
- Peaty soils (peat and organic soils that contain more than 20% organic matter)



How to texture your soil



Appendix 2

Useful contacts and publications

Contacts

Cross compliance advice	A practical advice service on the land management aspects of cross compliance. Helpline: 0845 345 1302 Website: www.crosscompliance.org.uk See also *The Guide to Cross Compliance in England*.
Defra	For information on any aspect of Defra's work, including cross compliance, please contact the Defra Helpline by telephone on 08459 33 55 77 or by email at helpline@defra.gsi.gov.uk, or see www.defra.gov.uk
Environment Agency	Rio House Waterside Drive Aztec West Almondsbury Bristol BS32 4UD Tel: 0870 8506506 Email: enquiries@environment-agency.gov.uk Website: www.environment-agency.gov.uk
Rural Payments Agency	PO Box 1058 Newcastle upon Tyne NE99 4YQ Tel: 0845 603 7777 Email: csc@rpa.gsi.gov.uk Website: www.rpa.gov.uk
Linking Environment and Farming (LEAF)	National Agricultural Centre Stoneleigh Kenilworth Warwickshire CV8 2LZ Tel: 02476 413 911 Fax: 02476 413 636 Email: enquiries@leafuk.org Website: www.leafuk.org

Farming and Wildlife Advisory Group (FWAG)	National Agricultural Centre Stoneleigh Kenilworth Warwickshire CV8 2RX Website: www.fwag.org.uk Tel: 02476 696 699 Fax: 02476 696 760 Email: info@fwag.org.uk
UK Soil Management Initiative Ltd	1 The Paddocks Powey Lane Mollington Chester CH1 6LH Website: www.smi.org.uk
Campaign for the farmed environment	www.cfeonline.org.uk

Soil Organic Matter Project

A joint project between Defra and Natural England is investigating and quantifying ways of improving soil organic matter management that can result in increased profits and additional benefits for farmers.
Visit www.gya.co.uk/index.cfm/page/profit.htm

Conservation Agriculture in Europe: An Approach to Sustainable Crop Production By Protecting Soil And Water

Copies can be ordered free of charge from SOWAP. Visit their website at www.sowap.org/ordercameo.htm

Soil Information Gateway

An online gateway from the Applied Research Forum. This web-based resource highlights tips, solutions and strategies to address problems such as erosion, compaction and poaching and provides case studies looking at the soil-related achievements of pioneering farmers: www.appliedresearchforum.org.uk/soils

SOWAP

SOWAP (Soil and Water Protection) represents a collaborative attempt by industry, NGOs, academic institutions and farmers to look at sustainable soil management: www.sowap.org

Soil Management Initiative (SMI)

The UK Soil Management Initiative (SMI) promoting the adoption by UK farmers and advisers of systems designed to protect and enhance soil quality: www.smi.org.uk

Soil erosion – Defra guidance

These guides are available online at:
www.defra.gov.uk/environment/quality/land/soil/information/publications.htm

- *Controlling soil erosion: a manual for the assessment and management of agricultural land at risk of water erosion in lowland England* – revised 2005 (PB 4093)
- *Controlling soil erosion: incorporating former advisory leaflets on grazing livestock, wind, outdoor pigs and the uplands, 2005.*

Soil management – Environment Agency guidance

These guides are available from the Environment Agency by contacting the helpline on 08708 506 506 or email: enquiries@environment-agency.gov.uk

- ThinkSoils – Soil assessment to avoid erosion and runoff
- Best Farming Practices – profit from a good environment

Produced by the Rural Payments Agency and the Department for Environment, Food and Rural Affairs

PB13315

Printed on recycled paper containing 80% post-consumer waste and 20% totally chlorine-free virgin pulp.

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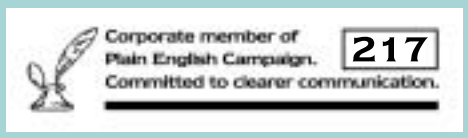

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December 2009