



The world beneath our feet

Connecting soils and curriculum



Introduction

Too readily dismissed as 'dirt', and usually confined in a curricular context within the boundaries of 'science', soils offer unlimited possibilities for interdisciplinary learning across Curriculum for Excellence; particularly within the key contexts of Learning for Sustainability and Health & Well-being.

Soils are one of our world's most precious resources, and globally, they are under pressure as never before. Awareness-raising and education as to their importance, and the empowerment of effective action by all sectors of society, are vital if we are to halt and reverse the decline in their well-being.

In order to maximise these benefits, and ensure coherence and clarity for educational practitioners, a focus group of soils experts was brought together in 2015 to create a 'suite' of stimulus resources to highlight the possibilities for learning that soils can offer. A key output of this approach is to ensure a legacy of learning beyond the 2015 International Year of Soils.

We hope that this suite of resources will inspire you to explore the wonderful and diverse world to be found right under our feet, and your feedback for further development of this resource is warmly welcomed.

You can contact us at:

soilsresource@yahoo.co.uk

How to use this resource

We've provided a series of soil-based activities that have been designed to add value across Curriculum for Excellence.

These activities have been grouped into three sections according to curricular level, namely:

- Early and First Level activities
- Second Level activities
- Third and Fourth Level activities

The table at the beginning of each section provides an at-a-glance of the activities in that section and the areas of Curriculum for Excellence that they are designed to add value to. Specific experiences and outcomes have not been included in order to empower a creative and flexible approach.



Contents

Page	Introduction
2	Magical mud!
3	What is soil?
4	Shallow soils...deep troubles
5	What can we do to help?
6	Soils and learning
Activities	
7	Early and First Level activities
15	Second Level activities
20	Third and Fourth Level activities
Further resources	
25	Resource summary
29	Who can help?



Magical mud!

Soils are so much more than mere 'dirt'. Did you know, for example, that:



© DAVID RILEY

One quarter of the world's biodiversity is found in the soil

...which in turn supports most of the food chains on our planet



© STEVE ADDY

Soils filter our water and purify our air



Healthy soils store more carbon than all the forests in the world

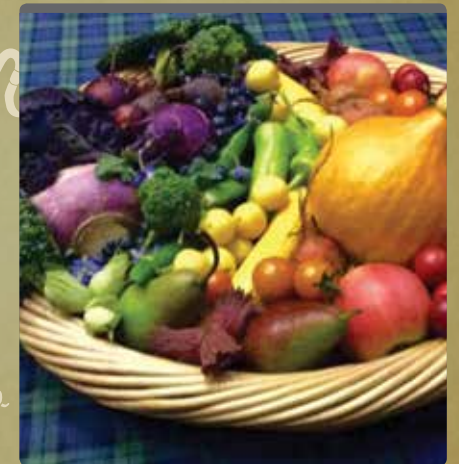
...helping us to combat climate change



© DAVID RILEY



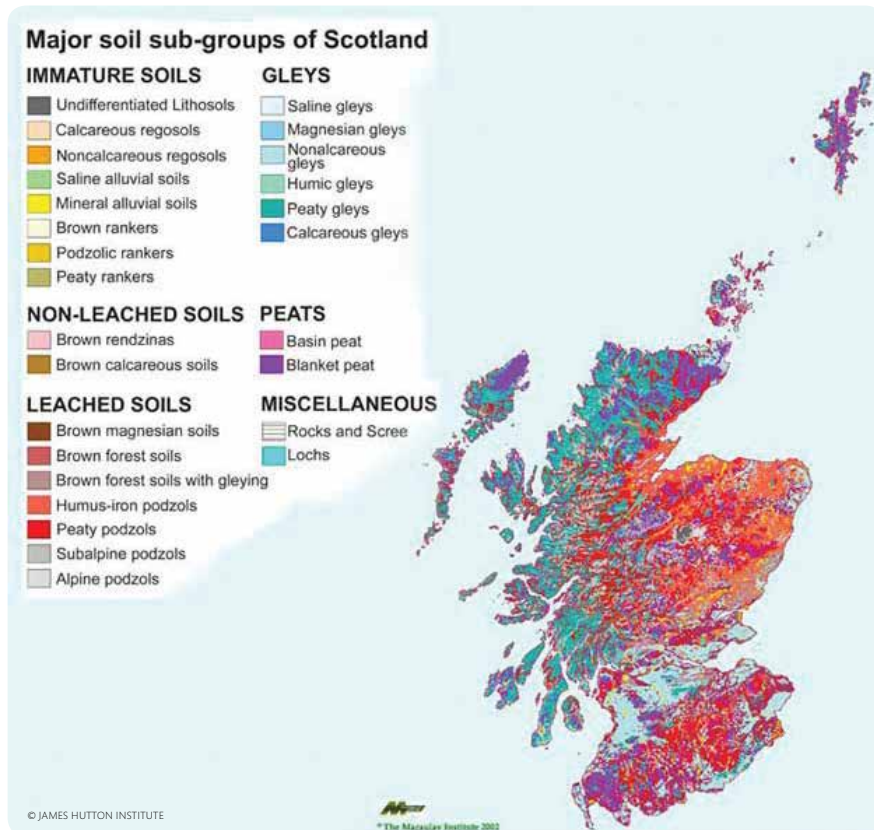
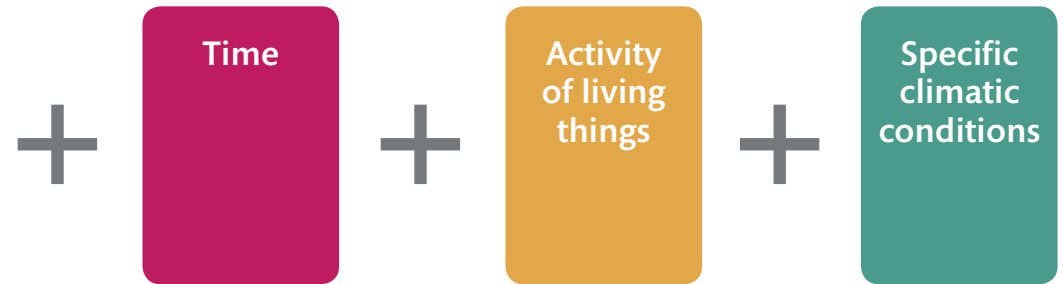
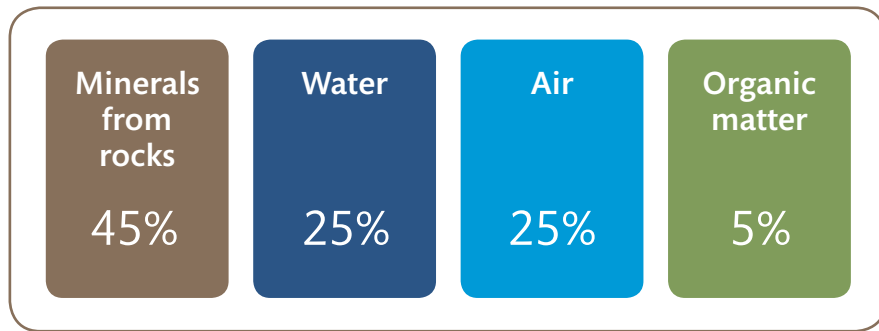
95% of all our food relies on healthy soils



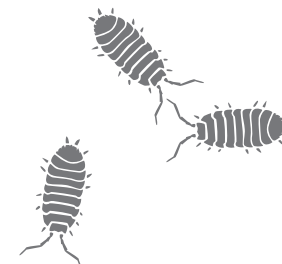
© PAM RODWAY / CROFTING CONNECTIONS

What is soil?

In general, soil is made up of:



'We know more about the movement of celestial bodies than about the soil underfoot.'
Leonardo Da Vinci, circa 1500s



Scotland's soils

...are incredibly diverse

...and they've shaped our culture, economy and landscape for centuries.



Shallow soils ...deep troubles



© GRAEME PATON / UNIVERSITY OF ABERDEEN

DEEP TROUBLE #1

EROSION

Linked to deforestation, drainage and intensive farming. Made worse by wind, drought and water.



© COLIN CAMPBELL / JAMES HUTTON INSTITUTE

DEEP TROUBLE #2

LOSS of ORGANIC MATTER

Linked to artificial fertilisers, erosion, compaction, sealing.
Soil organisms starve and loss of biodiversity impacts on the soil's ability to combat 'pests' by itself.
Soil nutrient quality is affected.

Every minute, we lose the equivalent of 30 football pitches of fertile soil



© US DEPARTMENT OF AGRICULTURE

DEEP TROUBLE #3

SALINISATION

Linked to poor water management.

Soil becomes unable to support its usual range of life.

Up to half our household waste could be composted to nurture our soil



© FOOD FOR LIFE SCOTLAND

DEEP TROUBLE #4

SEALING

Linked to human building activities.

Soil biodiversity is suffocated and water run-off is displaced: causing or worsening flooding.

It can take up to 1000 years for just 1cm of topsoil to form



© NIKKI BAGGALEY / JAMES HUTTON INSTITUTE

DEEP TROUBLE #5

COMPACTION

Linked to human activity; including farming.

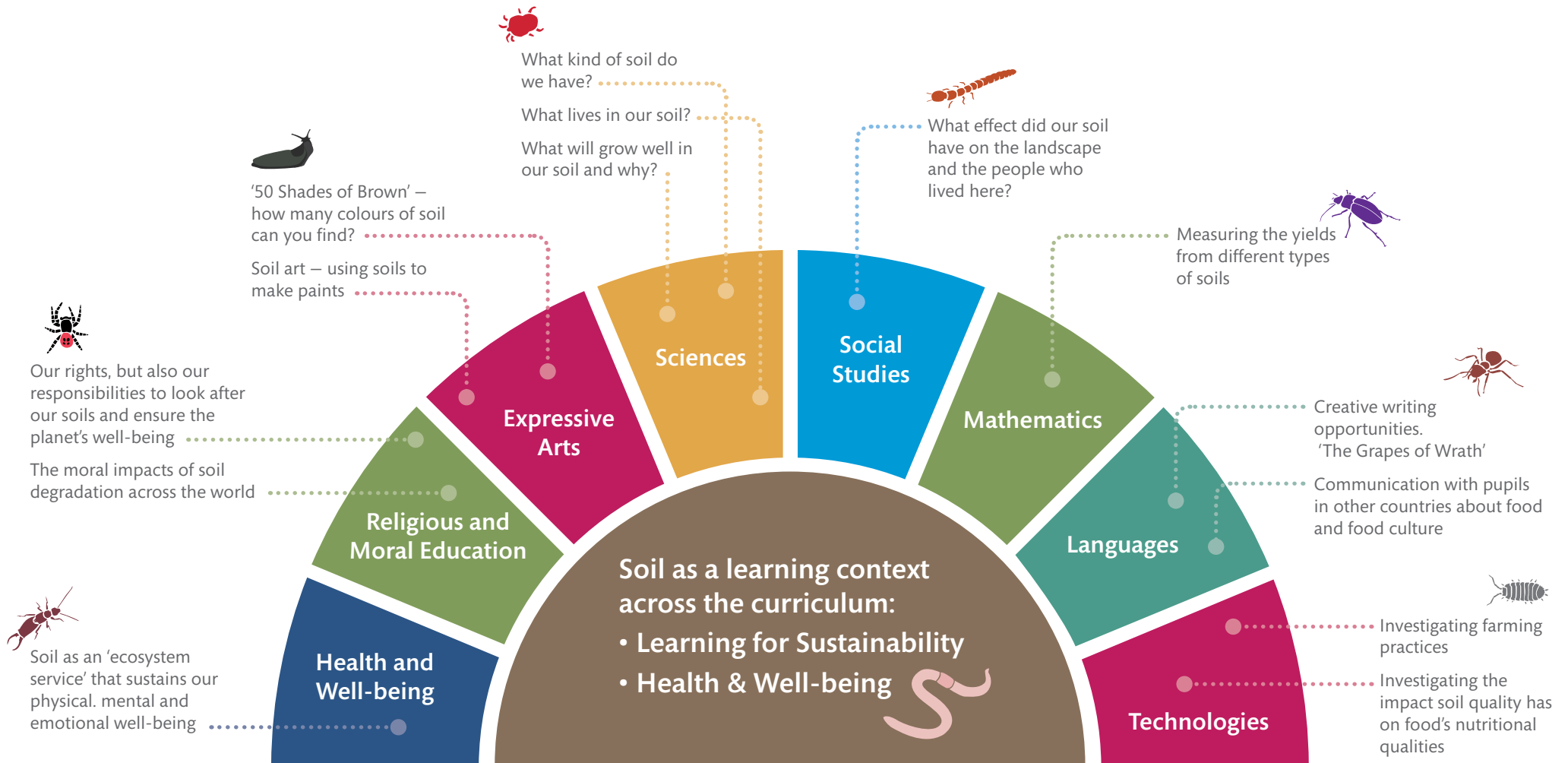
Heavy machinery and over-grazing destroys soil structure and biodiversity.

What can we do to help?



Soils and Learning

Soils can add value to learning across Curriculum for Excellence. Some initial ideas include:



Use the activities in this pack to discover many more ideas and suggestions for using soils as a learning resource.

Early and First Level Activities

Activity		Expressive Arts	Technologies	Mathematics	Religious and Moral Education	Languages	Health and Well-being	Sciences	Social Studies	Learning for Sustainability
1	Muddy Masterpieces	✓	✓			✓		✓	✓	✓
2	Wild Words					✓		✓		
3	Gardening with children	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	The Wonderful World of Soil					✓	✓	✓		✓
5	At Home in the Soil	✓	✓			✓		✓		✓
6	Worm-charming	✓		✓				✓		
7	Mud Play	✓	✓	✓						

Activity 1



EARLY AND FIRST LEVEL

Muddy Masterpieces!

Soils were the original paint and are still used today by many cultures and modern artists.

Learn to love soil through creating beautiful art from this surprising, sensory and cheap resource!

		Additional resources
Expressive Arts	<ul style="list-style-type: none"> Use fabric or art paper to make more permanent pictures. How big can you make your pictures? And how small? Use different things to paint with like your fingers or bundles of leaves - what works the best? 	OPAL Painting with Soil
Technologies	<ul style="list-style-type: none"> Make your own paper from paper that's already been used. Why not put seeds from herbs and flowers in the paper mixture and plant your paper once it's been used? Try planting it in different soils. What grows best where? 	
Mathematics		
Religious and Moral Education		
Languages	<ul style="list-style-type: none"> Write a 'recipe' for each colour you make and give it a descriptive name. 	
Health and Well-being		
Sciences	<ul style="list-style-type: none"> How thick or runny can you make the mud paint? What happens to the paint if you paint on vertical things? What things can you learn about the structure of your soils when you explore them this way? Do all soils respond in the same way? Try drying and crushing your soil samples and then measure and mix them with water in different quantities. What dissolves and what doesn't? Why might that be? 	
Social Studies	<ul style="list-style-type: none"> Explore your local area to discover the potential palette of colours beneath your feet. What colours of soil can you find? Do they change the further you dig down? Create a muddy map of your local area to show where different colours can be found. 	
Learning for Sustainability	<ul style="list-style-type: none"> Use your soil paint on trees, leaves, walls, playgrounds or any other surfaces you can find outside. 	

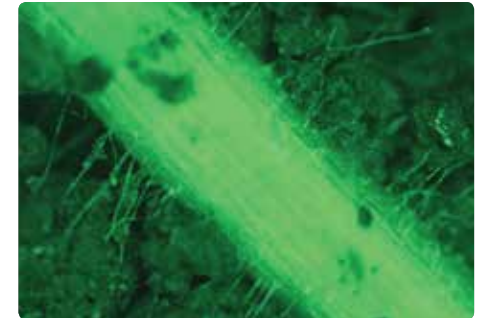


Activity 2 EARLY AND FIRST LEVEL

Wild Words



What's in a name? Explore the wonderful world of words through the soils beneath your feet.



© JAMES HUTTON INSTITUTE

		Additional resources
Expressive Arts		Early Learning HQ (online booklist) Soil Culture fiction & non-fiction list
Technologies		
Mathematics		
Religious and Moral Education		
Languages	<ul style="list-style-type: none"> We call it soil, earth, dirt... It can be squidgy, clayey, sticky, gritty, slick, stony, dusty... We can describe it as peaty, loamy, rich, chalky... How many more words can you find? Can all soils be described in the same way? It is much easier to engage with a story when you can relate to the characters or the topic so help bring books to life by reading tales that link with your children's practical experiences outdoors such as gardening. 	
Health and Well-being		
Sciences	<ul style="list-style-type: none"> Can you find any good stories or songs about things that live in the soil or the things it is made of? A worm's life, or perhaps the journey of a pebble? 	
Social Studies	<ul style="list-style-type: none"> Explore your local area to discover the potential palette of colours beneath your feet. What colours of soil can you find? Do they change the further you dig down? Create a muddy map of your local area to show where different colours can be found. 	
Learning for Sustainability		

Activity 3 EARLY AND FIRST LEVEL

Gardening with Children



'The nation that destroys its soil destroys itself.'

Franklin D. Roosevelt

There is a real feel-good factor associated with working with soil.

Gardens provide us with a nurturing environment in which both plants and people can grow, and one of the most important elements of that is soil. Everyone can take part and enjoy a chance to work together towards a shared outcome.

Start with simple things like pea shoots, radish and lettuce, all of which grow well in the Scottish climate.

Don't worry if you don't have a 'proper' garden – you can grow food in all sorts of containers.

		Additional resources
Expressive Arts	<ul style="list-style-type: none"> • Grow an edible rainbow! Borage for its blue flowers, purple heritage carrots, green beans...the possibilities are endless. How many colours can you eat? • How many colours of soils can you find? 	<p>Gardening in early years settings</p> <ul style="list-style-type: none"> • Development of beliefs & values • Food and the consumer • Physical Well-being • Biodiversity & Interdependence <p>Gardening with Kids (Fife Diet)</p> <p>BBC Gardening With Children</p> <ul style="list-style-type: none"> • Food & the consumer; • Biodiversity & Interdependence <p>Religious Festivals Calendar</p> <p>Skill Up, Start Cooking</p> <ul style="list-style-type: none"> • 'Grow a Soup' activities • Make your own leaf fertiliser <p>Food Standards Scotland</p> <ul style="list-style-type: none"> • health & safety guidance on hygienic food preparation
Technologies	<ul style="list-style-type: none"> • Introduce children to basic food preparation skills: starting with digging or harvesting their own food from the soil, and how to safely and hygienically turn their produce into delicious food. • Explore different cooking methods outdoors and indoors. 	
Mathematics	<ul style="list-style-type: none"> • Measure how high your plants grow. Compare and contrast the different sizes of seeds, pods, roots, and stems. Do different soils make them grow better? 	
Religious and Moral Education	<ul style="list-style-type: none"> • Make links between food production and important events in the religious calendar such as planting or harvest festivals, or other occasions where food has this kind of significance. 	
Languages	<ul style="list-style-type: none"> • What words would you use to describe what you're growing? 	
Health and Well-being	<ul style="list-style-type: none"> • Explore the importance of physical, social and self-management skills involved in dealing with food hygiene and taking small risks. • Discuss the health benefits of eating vegetables and fruits you have grown yourselves. • How does working with the soil to grow food make you feel? • Learn about the importance of safe, hygienic practices when growing and preparing food. 	
Sciences	<ul style="list-style-type: none"> • Explore the effect of the seasons in action. What foods are available when? • Explore how well the same plants grow in different soils. Do some soils suit some plants better than others? Why? • Think beyond your vegetables - what other things depend on the soil to grow? What about wider ecosystems? 	
Social Studies	<ul style="list-style-type: none"> • What foods grow where you live? Explore the wild foods available in your area. Do they all grow in the same kind of soils or different ones? 	
Learning for Sustainability	<ul style="list-style-type: none"> • Use food growing as a valuable, multi-sensory, real-world experience for children to develop a sense of caring for the world around us. What would happen if there was no soil? • Make food-growing containers out of recycled materials. Get creative! • An ethos of caring, sharing and fairness mean remembering to garden for wildlife too – 50% for us, 50% for wildlife. Explore how to make your local area more wildlife friendly (don't forget the soil!) 	

Activity 4 EARLY AND FIRST LEVEL

The Wonderful World of Soil



Why is soil so important? How does it work? How do the actions of humans impact on the soil ecosystem? Begin to explore these questions through practical activities, in both the indoor & outdoor classroom, and in your wider local area.

How might a greater awareness of soil issues affect the choices we make in our lives? Do people care more about soils once they have learned about what can threaten or nurture them? If so, how can we share our understandings about the importance of soil and help other to care more about it too?



© JAMES HUTTON INSTITUTE

Expressive Arts	
Technologies	
Mathematics	
Religious and Moral Education	
Languages	<ul style="list-style-type: none"> • Investigate some of the fiction & non-fiction on the Soil Culture reading list.
Health and Well-being	<ul style="list-style-type: none"> • What is soil? What is it made of? Where does it come from? What is it made of? How can we help to nurture it? • How have our soils influenced the way we live over the centuries? How have our actions impacted on the soils? Explore the impact of soil on people and places across the world, past and present. What can we do to help our soils?
Sciences	
Social Studies	
Learning for Sustainability	<ul style="list-style-type: none"> • Why is healthy soil so important for everyone and everything on our planet?

Additional resources

[Teaching Soil](#)

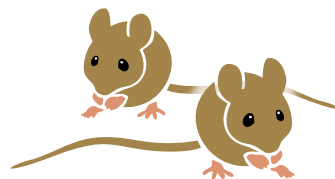
- Materials, Planet Earth
- People, Place, Environm't

[Dig it! The Secrets of Soil](#)

[Soil Culture fiction & non-fiction list](#)

Activity 5 EARLY AND FIRST LEVEL

At Home in the Soil



Have you ever stopped to wonder what lives in the soil in your outdoor area? Next time you have a mini-beast hunt, try digging a little deeper...



© JAMES HUTTON INSTITUTE

Expressive Arts	<ul style="list-style-type: none"> • Draw pictures of what you find living in your soil. Use soils as paints to colour them in!
Technologies	<ul style="list-style-type: none"> • Even we humans use earth and mud in our homes! Explore what the buildings are made of in your local area. Where did those building materials come from? Sustainable eco-homes often have grass roofs so what makes it such a good material for insulation? And did we get the idea from an earthworm...?
Mathematics	
Religious and Moral Education	
Languages	<ul style="list-style-type: none"> • Make up stories about who lives in your soils! What would a day in their life be like?
Health and Well-being	
Sciences	<ul style="list-style-type: none"> • If you are lucky enough to find a worm or two, stop... and look a bit harder. There is more to worms than you might think! But our soils aren't just home for insects – they keep some surprisingly big animals safe and warm too. What else can you find? • Compare what lives in different kinds of soils. Why do some soils suit some animals and not others? • What jobs do the animals in the soil do? Explore the vital roles of these little engineers and chemists!
Social Studies	
Learning for Sustainability	<ul style="list-style-type: none"> • How can we help the inhabitants of our soils to thrive? What would happen if they weren't there?

Additional resources

[Mini beasts](#)

- Biodiversity & Interdependence
- Data analysis
- Reading

[Burrowing animals](#) and [Underground homes](#)

Activity 6 EARLY AND FIRST LEVEL

Worm-charming



Healthy, living soils make a healthy Scotland and a healthy planet. They are a living community formed from all sorts of life forms – from microscopic bacteria to majestic trees.

Soils take thousands of years to form, can be destroyed in a few years, and can't be replaced in a lifetime. So, how do you check the health of the soil in your area? Ask the worms! But you've got to find them first by 'charming' them out of the soil. Worm charming can combine music, dance, science and maths along with some healthy competition to see who can find the most worms. If you don't find many – why might that be?



© JAMES HUTTON INSTITUTE

Expressive Arts	<ul style="list-style-type: none"> • Worm charmers use vibration and rhythmic patterns, and are inspired by the techniques of worm predators such as birds to create their own unique techniques. What techniques will you use?
Technologies	
Mathematics	<ul style="list-style-type: none"> • Use this activity to engage in some real-life maths.
Religious and Moral Education	
Languages	
Health and Well-being	
Sciences	<ul style="list-style-type: none"> • Use your results to fill in the simple Big Worm Dig online earthworm survey- it is a UK-wide survey so you will be taking part in some real-life citizen science.
Social Studies	
Learning for Sustainability	

Additional resources

Gardening With Children (blog):

[How do birds catch worms?](#)

- Vibrations and waves

Worm Charming Championships (website):

[How to Charm a Worm](#)

- Vibrations and waves
- Dance

Riverford Organic Farm (citizen science survey):

[Big Worm Dig](#)

- Food & the consumer
- Biodiversity & Interdependence
- Measurement; Data and analysis

Activity 7 EARLY AND FIRST LEVEL



Mud Play

As a rich learning environment, mud offers endless possibilities for children's development and creativity. If not a mud kitchen, any mud-play area where children can mix soil with water and other natural resources will provide a fantastic context for deep-play opportunities.

'A rainbow of soil is under our feet
 Red as a barn and black as peat.
 It's yellow as lemon and white as snow
 Bluish-grey too – so much colour below.
 Hidden in darkness as thick as the night –
 The only rainbow that can form without light.
 Dig you a pit, or bore you a hole,
 You'll find enough colours to well rest your soul.'
 A Rainbow of Soil Words (by FD Hole, 1985)

Expressive Arts	<ul style="list-style-type: none"> Explore the different textures created by different types of soil when mixed with water. Create pots, model animals, people...
Technologies	<ul style="list-style-type: none"> Create space for a mud kitchen in your outdoor area and cook-up some love for soil! Add in some inexpensive items such as spoons, pots and old pans to encourage their imagination. Practice real-life cooking skills such as whisking, shaping, mixing, and rolling. Adding some chopped up straw, tubs for moulds and sticks could turn your kitchen into a workshop for exploring mud as a building technology.
Mathematics	<ul style="list-style-type: none"> Mixing and measuring differing amounts of water and soils provides endless opportunities for comparison and discussion.
Religious and Moral Education	
Languages	
Health and Well-being	
Sciences	
Social Studies	
Learning for Sustainability	

Additional resources

[Mud kitchen](#)

- Planet Earth; forces, electricity and waves
- Art and Design
- People, Place and Environment
- Technological developments in society
- Money, Number, & Measure
- Food & Health

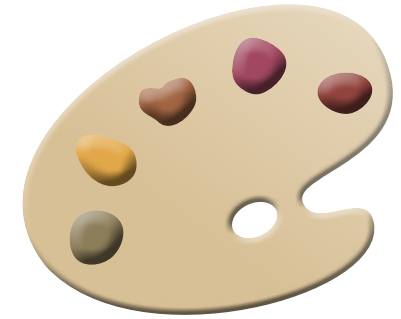
[Burrowing animals](#) and [Underground homes](#)

Second Level Activities

Activity		Expressive Arts	Technologies	Mathematics	Religious and Moral Education	Languages	Health and Well-being	Sciences	Social Studies	Learning for Sustainability
1	Painting with Soils	✓						✓	✓	
2	Healthy Soils, Healthy Planet					✓	✓	✓	✓	✓
3	At home in the Soil	✓	✓					✓		✓
4	SOS: Save Our Soils!		✓		✓	✓	✓	✓	✓	✓

Activity 1 SECOND LEVEL

Painting with Soils



Soils were the original paint and are still used today by many aboriginal cultures and modern artists.

Explore the connections between place and art by unlocking the painting potential of your local soils. You'll be joining in with an activity that is as ancient as cave painting, crosses continents, and still excites artists today.

Expressive Arts		Additional resources Painting with soil Mud Paintings Richard Long video Natalie Taylor
Technologies		
Mathematics		
Religious and Moral Education		
Languages		
Health and Well-being		
Sciences	<ul style="list-style-type: none"> • How thick or runny can you make the mud paint? What happens to the paint if you paint on vertical things? What things can you learn about the structure of your soils when you explore them this way? Do all soils respond in the same way? • Try drying and crushing your soil samples and then measure and mix them with water in different quantities. What dissolves and what does not? Why might that be? 	
Social Studies	<ul style="list-style-type: none"> • What colours of soil can you find in your local area? Does it change the further you dig down? • Write a recipe for each colour and give it a descriptive name. Create a muddy map of your local area to show where different colours can be found. 	
Learning for Sustainability		

Activity 2 SECOND LEVEL


Healthy Soils, Healthy Planet

'Almost all of the antibiotics we take to help us fight infections were obtained from microscopic soil lifeforms.'

(The Little Book of 'Dirty Words', James Hutton Institute.)

We all depend on healthy soil but we are rarely aware of just how much. Our daily choices have an impact on the soils of the world; from the things we choose to eat to the things we throw away.



Expressive Arts	
Technologies	
Mathematics	
Religious and Moral Education	
Languages	<ul style="list-style-type: none"> Investigate some of the fiction and non-fiction on the Soil Culture reading list.
Health and Well-being	<ul style="list-style-type: none"> How does the health of our soils impact on the nutritional quality of our food? Use the 'Dirt Doctor' resource to find out more.
Sciences	<ul style="list-style-type: none"> Soil is not 'just soil': there are many different types, with their own distinct characteristics and uses. They are an indispensable part of the journey of our food to our plates and they can suffer from 'bad health' if they are put under too much stress just the same as we can. Start to explore the different soils of Scotland using the fun 'Dirt Doctor' character cards and some simple practical investigation ideas from Soil-net.
Social Studies	<ul style="list-style-type: none"> The way we depend on the soil is often hidden from our everyday lives but the information, hands-on activities and recipes contained in 'Soils of the Crofts' helps us to explore the past, present and possible futures of Scotland's farming. Play the online game 'Pipe Dreams' to test your theories about impacts of land use.
Learning for Sustainability	<ul style="list-style-type: none"> What can we do to keep our soils healthy? Explore the different kinds of soils across the world and the threats they face.

Additional resources

[Soils of the Crofts](#)

[Pipe Dreams](#)

[Dirt Doctor](#)

Soil-net

[What's In Soil?](#)

[Soil Soaking](#)

[Hand Texturing](#)

[Soil Culture fiction & non-fiction list](#)



Activity 3 SECOND LEVEL

At Home in the Soil



Healthy, living soils make a healthy Scotland and a healthy planet. They contain living communities of all sorts of life forms, from the microscopic bacteria to majestic trees.

Have you ever stopped to wonder what lives in the soil in your outdoor area? Next time you have a mini-beast hunt, try digging a little deeper as well. The earth isn't just home for insects – it keeps some surprisingly big animals (and some birds) safe and warm too - around 25% of all plant and animal species spend a significant amount of their time in the soil.

Expressive Arts	<ul style="list-style-type: none"> • Draw pictures of what you find living in your soil. Use soils as paints to colour them in.
Technologies	<ul style="list-style-type: none"> • Even we humans use earth and mud in our homes! Explore what the buildings are made of in your local area. Where did those building materials come from? Sustainable eco-homes often have grass roofs so what makes it such a good material for insulation?
Mathematics	
Religious and Moral Education	
Languages	
Health and Well-being	
Sciences	<ul style="list-style-type: none"> • One teaspoon of soil may contain millions of living organisms belonging to thousands of different species. Discover the 'Hidden life of the Soil' with the printable 'Soil Families' card game (based on the popular game 'Happy Families') featuring soil characteristics, soil citizens and key factors in the history of soil science. • What jobs do the animals in the soil do? Explore the vital roles of these little engineers and chemists!
Social Studies	
Learning for Sustainability	<ul style="list-style-type: none"> • How can we help the inhabitants of our soils to thrive? What would happen if they weren't there?

Additional resources

[Minibeasts](#)

- Biodiversity & Interdependence
- Data analysis
- Reading

[Burrowing animals](#) and [Underground homes](#)

[Happy Families](#) – soils card game

[OPAL Soil Survey](#)



Activity 4 SECOND LEVEL

SOS: Save Our Soils!



Our soils are facing some huge challenges; desertification through climate change and deforestation, erosion through wind and water, compaction from heavy machinery and intensive livestock farming, 'sealing' from human building activity, contamination from agriculture and other industry – the list is long and complex. Exploring this most vital of topics can really help to bring STEM and Learning for Sustainability to life.



© JAMES HUTTON INSTITUTE

Expressive Arts	
Technologies	<ul style="list-style-type: none"> • Compare the technologies used in farming worldwide – how do they contribute to preserving or degrading soil? Could you design a soil-friendly farming method?
Mathematics	
Religious and Moral Education	<ul style="list-style-type: none"> • What impact do these soil challenges have on people across the globe? What about the natural world? What impact do they have on the UN Rights of the Child?
Languages	<ul style="list-style-type: none"> • Creative writing and investigative journalistic opportunities abound here – why not interview farmers/food producers, or contact pupils from another country/culture to find out about the impact of soil on their lives?
Health and Well-being	<ul style="list-style-type: none"> • What are the impacts of these soil challenges on our health & well-being?
Sciences	<ul style="list-style-type: none"> • Investigate some of the chemical and biological soil challenges such as salinisation.
Social Studies	<ul style="list-style-type: none"> • What impact does the way people live their lives have on our soils? Compare the activities of different cultures and societies across the world, past and present. • Investigate the physical processes that contribute to erosion, climate change, desertification etc. How do these come about? What can we do to minimise their impact?
Learning for Sustainability	<ul style="list-style-type: none"> • What are the wider global impacts of these soil challenges for the planet?

Additional resources

UNESCO Desertification resources
[UN Factsheets on Soils and their roles](#)
[Dig it! The Secrets of Soil](#)

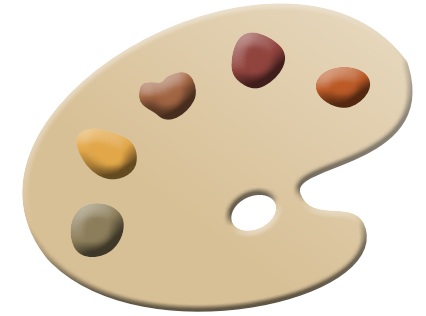
Third and Fourth Level Activities

Activity		Expressive Arts	Technologies	Mathematics	Religious and Moral Education	Languages	Health and Well-being	Sciences	Social Studies	Learning for Sustainability
1	Painting with Soils	✓	✓			✓			✓	
2	Healthy Soils, Healthy Planet		✓				✓	✓	✓	✓
3	At home in the Soil		✓					✓		✓
4	SOS: Save Our Soils!		✓		✓	✓	✓	✓	✓	✓

Activity 1 THIRD AND FOURTH LEVEL

Painting with soils

Soils were the original paint and are still used today by many aboriginal cultures and modern artists. Explore the connections between place and art by unlocking the painting potential of your local soils. You'll be joining in with an activity that is as ancient as cave painting, crosses continents, and still excites artists today.



Expressive Arts	<ul style="list-style-type: none"> • Use the inspiration of land and soil artists, such as Richard Long and Natalie Taylor, to stimulate your creativity and imagination. • Experiment with combinations of different soil-types with other media (soil and water, soil and glue, soil and wax...) to unlock the painting-potential of your local soils.
Technologies	<ul style="list-style-type: none"> • Make your own soil crayons – experiment with different soil types and textures.
Mathematics	
Religious and Moral Education	
Languages	<ul style="list-style-type: none"> • Explore some of the fiction & non-fiction on the Soil Culture reading list.
Health and Well-being	
Sciences	
Social Studies	<ul style="list-style-type: none"> • Can you illustrate the link between landscape and art to reflect the importance of soils through your work? • Explore the use and evolution of different pigments through the ages.
Learning for Sustainability	

Additional resources

[Painting with soil](#)

[Mud Paintings](#)

[Richard Long video](#)

[Natalie Taylor](#)

[Making soil crayons](#)

[CCANW Soil Art & Culture project](#)

[Soil Culture fiction & non-fiction list](#)

[Pigments through the ages](#)



Activity 2 THIRD AND FOURTH LEVEL

Healthy Soils, Healthy Planet



'The Nation that destroys its soil destroys itself.'

Franklin D. Roosevelt - *The Little Book of 'Dirty Words'*, James Hutton Institute.

We all depend on healthy soil but we are rarely aware of just how much. Our daily choices have an impact on the soils of the world; from the things we choose to eat to the things we throw away. These links are often hidden from our everyday lives but we can find local examples which help bring it to life.

		Additional resources
Expressive Arts		Soils of the Crofts
Technologies	<ul style="list-style-type: none"> Mobile apps can also help you to investigate soils in the field (SOCiT soil carbon calculator) and identify them (Soil Information for Scottish Soils). 	Pipe Dreams Dirt Doctor
Mathematics		SOCiT Soil Carbon Calculator
Religious and Moral Education		Soil information for Scottish soils app
Languages		Investigating soil structure
Health and Well-being	<ul style="list-style-type: none"> How does the health of our soils impact on the nutritional quality of our food? Use the 'Dirt Doctor' resource to find out more. Investigate the perceived decline in the nutrient content of our soils and how this impacts on the quality of the food we grow. Do different farming methods make a difference? Investigate good practice when it comes to food hygiene and soils. 	Organic food and nutrient content Food hygiene and safety
Sciences	<ul style="list-style-type: none"> Soil is not 'just soil': there are many different types, with their own distinct characteristics and uses. They are an indispensable part of the journey of our food to our plates and they can suffer from 'bad health' if they are put under too much stress just the same as we can. Start to explore the different soils of Scotland using the fun 'Dirt Doctor' character cards and some simple practical investigation ideas from Soil-net. Investigate the pH content of your soil. What does this mean in terms of what it can support? 	Soil-net What's In Soil? Soil Soaking Hand Texturing
Social Studies	<ul style="list-style-type: none"> Crofting provides one of Scotland's living examples of a more harmonious way to approach the care of soil through more sustainable land-use and farming practices. The importance of good soil-health becomes more obvious on small areas of land where poor soil quality can lead to repeated crop failures (for example, growing in raised beds or allotments, or the history of islands like St. Kilda in the Outer Hebrides). The information and hands-on activities in 'Soils of the Croft' helps us to explore the past, present and possible futures of Scotland's farming. Begin to explore the formation, characteristics and uses of different soil-types using the fun 'Dirt Doctor' character cards and some simple practical investigation ideas from Soil-net. 	
Learning for Sustainability	<ul style="list-style-type: none"> What can we do to keep our soils healthy? Explore the different kinds of soils across the world and the threats they face. 	



Activity 3 THIRD AND FOURTH LEVEL

At Home in the Soil: Citizen Science



Healthy, living soils make a healthy Scotland and a healthy planet.

They contain living communities of all sorts of life forms, from the microscopic bacteria to majestic trees.

Use the comprehensive OPAL resources to take part in the online soil (earthworm) survey; a UK-wide survey so you will be taking part in some real-life citizen science through practical fieldwork activities.

		Additional resources
Expressive Arts		Minibeasts <ul style="list-style-type: none"> • Biodiversity & Interdependence • Data analysis • Reading Burrowing animals and Underground homes Happy Families – soils card game OPAL Soil Survey
Technologies	<ul style="list-style-type: none"> • The OPAL soil survey is an excellent example of how digital technology is changing the way modern scientific research is being carried out. View your results online and compare them with other parts of the UK to find any patterns. 	
Mathematics		
Religious and Moral Education		
Languages		
Health and Well-being		
Sciences	<ul style="list-style-type: none"> • One teaspoon of soil may contain millions of living organisms belonging to thousands of different species. Discover the 'Hidden Life of the Soil' with the printable 'Soil Families' card game (based on the popular game 'Happy Families') featuring soil characteristics, soil citizens and key factors in the history of soil science. • Explore the vital roles played by soil organisms. 	
Social Studies		
Learning for Sustainability	<ul style="list-style-type: none"> • How can we help the inhabitants of our soils to thrive? What would happen if they weren't there? 	

Activity 4 THIRD AND FOURTH LEVEL

Save our Soils

Our soils are facing some huge challenges; desertification through climate change and deforestation, erosion through wind and water, compaction from heavy machinery and intensive livestock farming, 'sealing' from human building activity, contamination from agriculture and other industry – the list is long and complex. Exploring this most vital of topics can really help to bring STEM and Learning for Sustainability to life.

		Additional resources
Expressive Arts		UNESCO Desertification resources
Technologies	<ul style="list-style-type: none"> Compare the technologies used in farming worldwide – how do they contribute to preserving or degrading soil? Could you design a soil-friendly farming method? 	UN Factsheets on Soils and their roles Dig it! The Secrets of Soil
Mathematics		European Environment Agency videos
Religious and Moral Education	<ul style="list-style-type: none"> What impact do these soil challenges have on people across the globe? What about the natural world? What impact do they have on e.g. the UN Rights of the Child? 	Scotland's Soils – information, maps, and resources
Languages	<ul style="list-style-type: none"> Creative writing and investigative journalistic opportunities abound here – why not interview farmers/food producers, or contact pupils from another country/culture to find out about the impact of soil on their lives? 	Save our Soils Soil Erosion & degradation
Health and Well-being	<ul style="list-style-type: none"> What are the impacts of these soil challenges on our health & well-being? 	'Making the Case' – SEPA interviews with soil experts
Sciences	<ul style="list-style-type: none"> Use the online videos, reports, datasets and fact sheets from the resource list on the right to support independent research into soil. 	'Dirt! The Movie' 'Symphony of the Soils'
Social Studies	<ul style="list-style-type: none"> What impact does the way people live their lives have on our soils? Compare the activities of different cultures and societies across the world, past and present. Investigate the physical processes that contribute to erosion, climate change, desertification etc. How do these come about? What can we do to minimise their impact? Use your school grounds or local area as the basis for a real life investigation into human impacts on the environment, and investigate ways to manage the consequences. The SNH 'Guide for growing on land which may be contaminated' is a useful stimulus resource, and can also be used as a practical guide to assessing and developing grounds that may contain contaminated soil. The short 'Soil Sealing: Destroying Earth's Living Skin' film introduces the subject of 'soil sealing' (i.e. the loss of soil resources due to the covering of land for housing, roads or other construction work), something that causes increasing problems within our environment due to its often-unplanned, 'piecemeal' nature. What can we do about these problems? How can we develop a more integrated approach to planning and development? 	Soil Sealing: Destroying Earth's Living Skin Guide for Growing on Land which may be contaminated
Learning for Sustainability	<ul style="list-style-type: none"> Use the SEPA 'Making the Case' resource to explore different aspects of the critical importance of Scottish soil through a series of short films featuring some of Scotland's enthusiastic and knowledgeable soil professionals. The longer film deals with the global issues and challenges the role of society in the health of our soils, which could be used as a stimulus to provoke debate about the moral choices we all make. 	

Resource summary



Here is a summary of all of the resources mentioned in the Activities

EARLY AND FIRST LEVEL

No.	RESOURCE TITLE	LEVEL	ORGANISATION	URL
1	Painting with soil	Early First	OPAL	http://opal.cc.ic.ac.uk/sites/default/files/7/file/Painting-with-soil_0.pdf
2	Soil booklist for children	Early First	Early Learning HQ	http://www.earlylearninghq.org.uk/
3	Soil fiction and non-fiction list	Early First	Soil Culture	https://soilculture.files.wordpress.com/2014/07/soil-culture-recommended-reading.pdf
4	Gardening in early years settings	Early First	Early Learning HQ	http://www.earlylearninghq.org.uk/earlylearninghq-blog/gardening-in-early-years-settings/
5	Gardening with kids	Early First	Fife Diet	http://fifediet.co.uk/2015/02/10/a-garden-for-kids/
6	Gardening with children	Early First	BBC	http://www.bbc.co.uk/gardening/gardening_with_children/
7	Religious festivals calendar	Early First	RE Online	http://www.reonline.org.uk/supporting/festivals-calendar/
8	School gardening campaign	Early First	Royal Horticultural Society	https://schoolgardening.rhs.org.uk/home
9	Skill Up, start cooking	Early First	Focus on Food	http://www.focusonfood.org/resources_equipment
10	Food safety advice	Early First	Food Standards Scotland	http://www.foodstandards.gov.scot/food-safety-standards/food-safety-hygiene
11	Teaching soil toolbox	Early First	Teaching Soil	http://www.teaching-soil.eu/en/en_index.php
12	Dig It! The secrets of soil	Early First	International Year of Soil	http://www.fao.org/soils-2015/resources/educational/en/
13	Minibeasts	Early First	TES	https://www.tes.com/resource-collections/Minibeasts-6400136/
14	Burrowing animals Underground homes	Early First	BBC	http://www.bbc.co.uk/programmes/b03bfjrj/clips http://www.bbc.co.uk/nature/23632577
15	How do birds catch worms?	Early First	Gardening with Children	http://gardeningwithchildrenblog.co.uk/tag/how-do-birds-catch-worms/
16	How to charm a worm	Early First	Worm Charming Championships	http://www.wormcharming.com/rules.html#.VqnEFvmLTIU
17	Big worm dig	Early First	Riverford Organic Farms	http://www.riverford.co.uk/bigwormdig
18	Muddy kitchen	Early First	Muddy Face	http://www.muddyfaces.co.uk/mud_kitchens.php/#Just_Do_It

SECOND LEVEL

No.	RESOURCE TITLE	LEVEL	ORGANISATION	URL
19	Painting with Soil	Second	OPAL	http://opal.cc.ic.ac.uk/sites/default/files/7/file/Painting-with-soil_0.pdf
20	Soil paintings	Second	Tate Gallery	http://www.tate.org.uk/art/artworks/long-river-avon-mud-drawings-ten-mud-dipped-papers-ar00616
21	Soil artist at work	Second	Richard Long	https://www.youtube.com/watch?v=JD2Ai_BEcbg
22	The alchemy of soil	Second	Natalie Taylor	http://issuu.com/natalietaylor80/docs/issuu_book
23	Soils of the crofts	Second	James Hutton Institute Crofting Connections	http://www.hutton.ac.uk/sites/default/files/files/education/croftingbook/pageflip.html
24	Pipe dreams	Second	Macaulay Land Use Institute	http://www.macaulay.ac.uk/resources/Pipe-Dreams2.swf
25	Dirt doctor	Second	James Hutton Institute	http://www.hutton.ac.uk/learning/dirt-doctor
26	What's in soil?	Second	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_WhatsInSoil1.pdf
27	Soil soaking	Second	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_SoilSoaking.pdf
28	Hand texturing	Second	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_HandTexturing1.pdf
29	Soil fiction and non-fiction list	Second	Soil Culture	https://soilculture.files.wordpress.com/2014/07/soil-culture-recommended-reading.pdf
30	Minibeasts	Second	TES	https://www.tes.com/resource-collections/Minibeasts-6400136/
31	Burrowing animals	Second	BBC	http://www.bbc.co.uk/programmes/b03bfjrj/clips
32	Happy families card game	Second	EU Soils	http://eussoils.jrc.ec.europa.eu/Awareness/Documents/Material/planche_cartes_GESSOL.pdf
33	Soil survey	Second	OPAL	http://www.opalexplornature.org/soilsurvey
34	Desertification	Second	UNESCO	http://www.unesco.org/mab/doc/ekocd/chapter1.html
35	Soils and their roles	Second	International Year of Soils website	http://www.fao.org/soils-2015/resources/fact-sheets/en/#c326621
36	Dig it!	Second	International Year of Soils website	http://www.fao.org/soils-2015/resources/educational/en/



THIRD AND FOURTH LEVEL

No.	RESOURCE TITLE	LEVEL	ORGANISATION	URL
37	Painting with soil	Third Fourth	OPAL	http://opal.cc.ic.ac.uk/sites/default/files/7/file/Painting-with-soil_0.pdf
38	Soil paintings	Third Fourth	Tate Gallery	http://www.tate.org.uk/art/artworks/long-river-avon-mud-drawings-ten-mud-dipped-papers-ar00616
39	Soil artist at work	Third Fourth	Richard Long	https://www.youtube.com/watch?v=JD2Ai_BECbg
40	The alchemy of soil	Third Fourth	Natalie Taylor	http://issuu.com/natalietaylor80/docs/issuu_book
41	Making soil crayons	Third Fourth	Doctor Dirt	http://doctordirt.org/soil-crayons
42	Soil art and culture workshop	Third Fourth	Centre for Contemporary Art & the Natural World	https://soilculture.wordpress.com/
43	Pigments through the ages	Third Fourth	Web Exhibits	http://www.webexhibits.org/pigments/
44	Soil fiction and non-fiction list	Third Fourth	Soil Culture	https://soilculture.files.wordpress.com/2014/07/soil-culture-recommended-reading.pdf
45	Soils of the crofts	Third Fourth	James Hutton Institute Crofting Connections	http://www.hutton.ac.uk/sites/default/files/files/education/croftingbook/pageflip.html
46	Pipe dreams	Third Fourth	Macaulay Land Use Institute	http://www.macaulay.ac.uk/resources/Pipe-Dreams2.swf
47	Dirt doctor	Third Fourth	James Hutton Institute	http://www.hutton.ac.uk/learning/dirt-doctor
48	Soil carbon calculator	Third Fourth	James Hutton Institute	http://www.hutton.ac.uk/news/new-soil-carbon-app-scottish-farmers
49	Information on Scottish soils	Third Fourth	James Hutton Institute	http://sifss.hutton.ac.uk/
50	Investigating soil structure	Third Fourth	SRUC	http://www.sruc.ac.uk/info/120625/visual_evaluation_of_soil_structure
51	What's in soil?	Third Fourth	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_WhatsInSoil1.pdf
52	Soil soaking	Third Fourth	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_SoilSoaking.pdf
53	Hand texturing	Third Fourth	Soil-Net	http://www.soil-net.com/sm3objects/activities/Activity_HandTexturing1.pdf
54	Minibeasts	Third Fourth	TES	https://www.tes.com/resource-collections/Minibeasts-6400136/
55	Burrowing animals Underground homes	Third Fourth	BBC	http://www.bbc.co.uk/programmes/b03bfjrj/clips http://www.bbc.co.uk/nature/23632577
56	Happy families card game	Third Fourth	EU Soils	http://eussoils.jrc.ec.europa.eu/Awareness/Documents/Material/planche_cartes_GESSOL.pdf
57	Soil survey	Third Fourth	OPAL	http://www.opalexplorenature.org/soilsurvey
58	Desertification	Third Fourth	UNESCO	http://www.unesco.org/mab/doc/ekocd/chapter1.html
59	Soils and their roles	Third Fourth	International Year of Soils website	http://www.fao.org/soils-2015/resources/fact-sheets/en/#c326621
60	Dig it!	Third Fourth	International Year of Soils website	http://www.fao.org/soils-2015/resources/educational/en/



61	Importance of Soil	Third Fourth	European Environment Agency	http://www.eea.europa.eu/themes/soil
62	Scotland's Soils	Third Fourth	Scotland's Environment	http://www.soils-scotland.gov.uk/
63	Save our Soils	Third Fourth	Save our Soils	http://saveoursoils.com/downloads.html
64	Soil erosion & degradation	Third Fourth	WWF	http://www.worldwildlife.org/threats/soil-erosion-and-degradation
65	Interviews with soil experts	Third Fourth	SEPA	http://www.sepa.org.uk/making-the-case/media-items/?topic=Soil&id=5803
66	Dirt! The Movie	Third Fourth	Common Ground Media	https://www.youtube.com/watch?v=lvrww8iMI-A&list=RDlvrww8iMI-A&index=1
67	Symphony of the Soil	Third Fourth	Deborah Koons-Garcia	http://www.symphonyofthesoil.com/the-films/about-the-films/
68	Soil sealing	Third Fourth	TV Link Europe	http://www.tvlink.org/mediadetails.php?key=64640b2a69a635e84c10&title=Soil+sealing+-+Destroying+earth%2527s+living+skin&titleleft=Environment
69	Growing on contaminated land	Third Fourth	SNH	http://www.snh.gov.uk/docs/A1486604.pdf
70	Living Soils: A Call to Action	Third Fourth	Soil Association	http://www.soilassociation.org/soils
71	Organic food & nutrient content	Third Fourth	Guardian article	http://www.theguardian.com/environment/2014/jul/11/organic-food-more-antioxidants-study
72	Food hygiene & safety	Third Fourth	Food Standards Scotland	http://www.foodstandards.gov.scot/food-safety-standards/food-safety-hygiene



Who can help?

	BODY	URL
1	Crofting Connections	http://croftingconnections.com/
2	Education Scotland	http://www.educationscotland.gov.uk/
3	Field Studies Council	http://www.field-studies-council.org/centres/scotland.aspx
4	Food for Life Scotland	http://www.soilassociation.org/foodforlifescotland
5	Food Standards Scotland	http://www.foodstandards.gov.scot/
6	Forestry Commission Scotland	http://scotland.forestry.gov.uk/
7	James Hutton Institute	http://www.hutton.ac.uk/
8	OPAL Explore Nature	http://www.opalexplornature.org/surveys
9	Royal Highland Education Trust	http://www.rhet.org.uk/Resources
10	Scottish Environmental Protection Agency	http://www.sepa.org.uk/
11	SRUC	http://www.sruc.ac.uk/
12	Scottish Natural Heritage	http://www.snh.gov.uk/
13	Soil Association Scotland	http://www.soilassociation.org/scotland

'We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.'

Aldo Leopold, 1949. *A Sand County Almanac*

