

Chapter 10 – RIGS and Education

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10.1 The importance of Earth science education for life-long learning

Introduction

Since the first edition of this handbook much has changed in the world of education, but the principles of using geoconservation sites remain the same. There have been major updates to the National Curricula in Science and Geography across the UK, especially with a fieldwork focus in Wales. There have been major advances for Earth sciences in teacher education and professional development, including the UKRIGS Education Project - Earth Science On-Site. Through the media there has been increased public awareness and understanding of long-term changes in the Earth's environment, and their impact on the future of humanity.

The value and use of geological and geomorphological sites as an educational resource form a major justification for their conservation and designation as RIGS. The four criteria for the justification of RIGS were originally outlined in Earth Heritage Conservation in Great Britain - a Strategy (NCC, 1990), with the placing of Education at the top of this list being quite intentional:

- Education, including life-long learning
- Intrinsic scientific interest
- Historical context
- Aesthetic value

Sites of Special Scientific Interest (SSSIs) are designated primarily for their scientific value, but may also have educational value. This chapter applies equally well to SSSIs with educational value as it does to RIGS.

Education in this context is the development of knowledge and understanding by individuals about themselves and the world around them. It is much more than just the formal school-based approach to learning a classroom subject; it is a broader, holistic understanding that can enrich the individual's life experience. This is commonly termed life-long learning, and it is as important for the personal fulfilment of the lives of adults as it is for the formal education of young people.

The public are becoming more aware of the Earth sciences, with improved understanding, but there is a long way to go before it matches that of the biological sciences. A wider understanding that geodiversity underpins biodiversity has been a significant development in recent years. Education continues to be vital in this broad area of nature conservation, and placing education at the heart of the RIGS network will ensure the long-term future for the role of RIGS.

Geoconservation is defined as: "Geological and geomorphological conservation", Prosser, C., 2002, in Terms of endearment, *Earth Heritage* (17) 12-13

Geodiversity is defined as:

"the variety of rocks, fossils and minerals and natural processes", Prosser, C., 2002, in Terms of endearment, *Earth Heritage* (17) 12-13

"is also the link between people, landscapes and their culture through the interaction of biodiversity with soils, minerals, rocks, fossils, active processes and the built environment",

Stanley, M. 2000, in Geodiversity, *Earth Heritage* (14) 15-18

Geoconservation has been given parity of importance with wildlife conservation in recent legislation affecting England and Scotland.

In England, Planning Policy Statement 9 (PPS9), Biodiversity and Geological Conservation and associated guidance deal with the statutory requirements of SSSIs. The non-statutory sites (called local geological sites and local wildlife sites) are covered by DEFRA's Local Sites: Guidance on their Identification, Selection and Management.

In Scotland, non-statutory sites (called local geodiversity and local biodiversity sites) are covered by Guidance on Establishing and Managing Local Nature Conservation Site Systems in Scotland.

The local sites guidance for Wales is being written, while Sites of Local Nature Conservation Importance in Northern Ireland are currently under review (March 2008).

Local sites guidance should be taken forward by the formation of local sites partnerships. RIGS groups need to be proactive in these local partnerships. Make contact with your local Wildlife Trust and planning authority to ensure that the geological agenda is taken seriously. This should include the promotion of the educational value of local geological sites, as well as site conservation.

The wider message

The science behind natural catastrophes is now better explained in the media than in the past. Prime-time television news and documentaries have featured Earth science matters in some depth, and brought them to a wider audience. The result has been a growing appreciation of the importance of Earth sciences to the lives of ordinary people, though much remains to be done at a local level.

RIGS and SSSIs need to be appreciated by the public at large, as well as those responsible for planning decisions, to ensure they have a secure future. For the RIGS movement to flourish, it is vital that education is seen as a major part of RIGS work; people must hear and care about geodiversity and geoconservation, and be encouraged to take an active part in it.

Partnerships at both local and regional level are being forged by many RIGS groups, with the creation of Local Geodiversity Action Plans (LGAPs), commonly based on administrative counties. Local authorities are key partners in the production and delivery of LGAPs and should be involved from the start. LGAPs should include the development of educational use of sites with accompanying resources.

A wider development of Local sites partnerships between RIGS Groups, Wildlife Trusts and local planning authorities should ensure common agendas across their diverse interests. In many cases there is cross-representation between members of LGAP and LBAP (B=Biodiversity) Partnerships.

A more recent development has been the production of Company GAPs (cGAPs) by several Quarrying companies. These often involve consultation with local RIGS Groups, educationalists and the public. For example, Aggregate Industries is developing one with a strong educational focus.

Evaluation of individual RIGS sites should include a rigorous assessment of educational value. This should include how each site could be used to maximise its educational potential for all types of audience. The aim of this chapter is to support RIGS education work; it cannot be an exhaustive treatment of educational opportunities. It is for RIGS

groups within local sites partnerships to identify and develop the educational potential of selected geological and geomorphological sites.

UKRIGS Recording and Assessment Criteria for RIGS sites, including their educational value, are downloadable from the UKRIGS website. This UKRIGS approach to site recording and assessment is supported by the Local Sites Guidance in both England (DEFRA) and Scotland (SNH).

UKRIGS urge local RIGS groups to use this approach when assessing sites for RIGS status.

Following designation of a RIGS site comes the task of promoting its educational use. This should form part of the management plan for every site. Site documentation should include the development of good quality educational material for use by those visiting each site. These should include, as appropriate, teaching guidance, field sketches, logs and task sheets that promote field skills and the ability to think in a scientific way, based on the collection, interpretation and evaluation of evidence. For this to be done well, the skills of experienced field teachers are needed. RIGS groups should endeavour to identify and recruit such people to the cause. This approach is exemplified in the UKRIGS Education Project, Earth Science On-Site. For details see Appendix 10.3.

10.2 RIGS and education: the historical situation

RIGS sites have been underused as educational resources for many years. Reasons include:

- lack of awareness of both their existence and their importance - by the public, national government, local authorities, industry, schools and even some universities.
- lack of awareness of their educational potential, especially by non-specialist teachers. Earth science in schools is mainly taught by science teachers with limited knowledge and understanding of this subject. This is in marked contrast to biology.
- problems of access and safety; there is a great deal of organisation involved for a teacher or other leader to take a group of 30 or more young students on a visit to a RIGS site. This includes the added time and effort involved for reconnaissance, the necessary risk assessment and obtaining landowner's permission, all to be achieved outside normal working hours.

These considerations should inform the way all RIGS groups address the educational use of sites. This can only be done if the educational potential of the sites has been rigorously assessed and evaluated using the UKRIGS Recording & Assessment procedure. This is much more than just recording what is there, and must be done before inviting outsiders to visit your sites.

RIGS groups need to be proactive in approaching government bodies, whether local, regional or national, to ensure the value of RIGS for Earth science education is understood by those who are decision makers in land use and planning. Educational use adds value to conservation sites and helps to deliver local authority targets.

RIGS groups need to approach industry, both extractive and manufacturing, to enlist their support and involvement in promoting an informed understanding of the importance of the Earth's geological features and resources to people's lives, specifically through the use of geoconservation sites. Extractive industries are becoming increasingly aware of geoconservation and education, with many of them producing cGAPs.

Schools, colleges and adult educators need to be made aware of this valuable but under-used educational resource on their doorstep. UKRIGS continues to develop exemplars across England for this purpose, backed by ALSF grants through the UKRIGS Education Project (see Appendix 10.3). In North Wales similar work has been done and plans are afoot for Scotland. Several RIGS groups have written educational materials and made contact with schools and colleges, offering to introduce teachers to their local RIGS resources; this approach is commended for wider use.

The educational use of RIGS has a high priority within the RIGS movement, from the selection of sites to the development of geological trails. The task involves much effort by large numbers of volunteers, including those with the necessary skills and experience to guide RIGS groups in achieving these aims effectively. RIGS groups are strongly advised to form balanced working groups as part of their LGAP agenda, including local teachers with the necessary skills and fieldwork experience.

10.3 Education as a justification for RIGS

RIGS have the potential to make a valuable contribution to Earth science education at all levels. However the value is often limited by lack of understanding of the attributes which make a site useful for teaching and learning. Not all RIGS will have high educational potential, and indeed for some sites educational use may be unacceptably damaging, but the majority should be seen as having wide educational use as a major purpose.

Teachers have been using sites around the UK for many years, long before the concept of RIGS developed. In selecting sites to visit, criteria such as accessibility, safety and landowner co-operation have always been important. A 1996 report from the Peak District National Park, RIGS: Conservation and Education Project, highlighted the need for more detailed guidance for the educational assessment of RIGS. This led directly to the development of site selection criteria for educational value by Staffordshire RIGS, further developed with English Nature funding, and adopted by UKRIGS. These criteria have been affirmed in Local Sites Guidance by DEFRA and SNH as good practice.

For many years, the champion of Earth science education in schools has been the Earth Science Teachers' Association (formerly the Association of Teachers of Geology). This has always been a small but highly active association, covering all aspects from primary schools to higher education. The association has wholeheartedly supported the RIGS movement from the start, and continues to do so.

The Earth Science Teachers' Association website at www.esta-uk.org provides much useful background to educational matters in Earth science, and will also lead you on to other useful sites.

10.3.1 Earth science in the curriculum in schools and colleges

In the past the teaching of Earth science in UK schools was restricted to relatively small numbers, mainly studying Geology at GCSE/Standard Grade and GCE Advanced Level/Higher Grade – a few thousand candidates each year. In England and Wales, following the introduction of the National Curriculum in 1989, all children have been taught some Earth science up to the age of 16. In Scotland and Northern Ireland there has been less emphasis on compulsory Earth science, though this may change in the future.

In recent years there have been concerns over fieldwork safety and the teacher liabilities involved. In 2007, the DfES (now the DCFS) published a manifesto: Learning Outside the Classroom which tried to address these issues in a positive manner. This is being

developed in practice by the Association for Science Education, who have set up a working group under the title of 'Science Without Walls'.

In the UK, over the whole 5-19 age range, there is a potential 'audience' of more than nine million children and young adults entitled to study geological aspects of Earth science through fieldwork! RIGS are the essential resource to meet this potential demand.

In England and Wales, Earth science teaching for ages 5-16 is mainly concentrated in the Science National Curriculum, with a smaller amount in the Geography National Curriculum. From 2008 a revised curriculum for 3 to 19-year-olds is to be implemented in Wales, with emphasis on fieldwork. The National Curriculum is divided into four Key Stages:

Primary Schools

Key Stage 1 [KS 1] Years 1-2, ages 5 - 7

Key Stage 2 [KS 2] Years 3-6, ages 7 -11

Secondary Schools

Key Stage 3 [KS 3] Years 7-9 ages 11 - 14

Key Stage 4 [KS 4] Years 10-11 ages 14 - 16

In Northern Ireland, the structure is similar to that in England and Wales, but without the Key Stage divisions. In Scotland the structure differs slightly; primary education covering ages 5-12, and secondary education 12-16, with teaching for Standard Grade courses beginning at age 14.

After the age of 16, two main routes are provided in full-time education in schools and colleges:

- the academically-based GCE AS and A2 levels [including Geology] in England and Wales; and in Scotland, Intermediate, Higher and Advanced Higher Levels. Some schools and colleges have adopted the International Baccalaureate (IB), but there is limited opportunity for using Earth science contexts.
- the vocationally-based courses in England and Wales in Applied Science, where there is at present a limited opportunity to use Earth science contexts. In Scotland, the SQA National Qualifications cover a range of qualifications that include an impressive range of optional units in Earth science at several levels.

10.3.2 Earth science fieldwork provision for schools

Schools are urged to use fieldwork in the delivery of the Science and Geography curricula, but many schools need help in understanding how to use the field environment to achieve their educational aims in these two areas of the curriculum. Geological field contexts are useful and potentially very effective vehicles for learning science.

As many schools lack the expertise in Earth science fieldwork, they need to call on the resources available outside the school to help them deliver the National Curriculum. Many Local Authorities provide field centres for their schools to visit on a daily or residential basis. Others are provided by the Field Studies Council, The Youth Hostels Association [SYHA in Scotland & YHANI in Northern Ireland] and other privately operated centres and voluntary organisations. The National Trust can generally provide an indoor area for school use.

10.3.3 Earth science in the Science curriculum

It may at first seem that 5-7 year-olds (Key Stage 1 in England and Wales) can derive little value from visiting a RIGS site. While this may be true from a geological perspective, children of this age may be able to use an accessible local RIGS site as part of the exploration and investigation of their locality. Although it is more likely to focus on biological, historical and geographical matters, the visit may nevertheless form an important foundation for later understanding of the local rocks and their uses. This Foundation Phase in the new curriculum in Wales places “a greater emphasis on using the outdoor environment as a resource for children’s learning”.

For 7-11/12 year-olds a field visit is likely to have more relevance. A visit to a RIGS site, as part of a more holistic investigation of a locality, covers aspects of Geography and History as well as Science. Children observe and record rocks and soils in the environment and collect specimens of rocks and soils for work back at school, with opportunities to consider the economic uses of the local rocks and minerals. Many older primary children undertake a week-long residential school in areas of high scenic value, having much geological & geomorphological interest. “Science contributes to the Curriculum Cymreig (7-14) by the use of contexts that are relevant to learner’s lives in Wales. The rich and varied environment around learners gives the basis for fieldwork”.

Children from 11/12 to 14 are ready for more ‘in-depth’ treatment of Earth science topics, and fieldwork should begin to play a more substantial role. The curriculum is now organised on a subject-specific basis, with geographical and scientific enquiry being taught separately. The needs of these two subjects are different, though complementary, but both imply the use of fieldwork to motivate and enhance learning, as spelt out in the Curriculum Cymreig (7-14).

In the final stage of compulsory schooling, ages 14-16, the varied options for examination courses still mean that the great majority of pupils can benefit from the use of Earth science contexts in their studies. For a few the treatment of Earth science topics may be developed to considerable depth, with fieldwork playing a substantial role.

RIGS have a major role to play at all levels in making suitable local provision accessible to schools wherever they may be based or may visit in the UK. It needs to be recognised that RIGS often contain educational opportunities in areas of Science outside geology, especially biology. This should be seen as a welcome opportunity for integrating scientific enquiry at the site.

10.3.4 Earth science in the Geography curriculum

Those readers whose education pre-dates the National Curriculum are likely to have received much of their education in Earth science, including Geology, through their broad Geography curriculum when they were at school. Things have changed! With the introduction of more geological topics into the school curriculum, the emphasis has been placed on Earth science, rather than on more descriptive Geology to serve the needs of the Geography curriculum. The enthusiasm of many Geography teachers in the past was an important factor in geological education, and the generation of similar enthusiasm in many science teachers remains a major task still to be properly addressed.

Geography is a compulsory subject only up to age 14. Beyond this the subject becomes optional. In addition, geological and geomorphological aspects in the Geography curriculum are in some cases optional alternatives, usually to an aspect of human geography. This has an important implication, for it is only within the Science curriculum that there is any guarantee that Earth science topics should be covered.

In general terms the Geography curriculum in England and Wales is less prescriptive than that for Science, and features more generalised statements. This leaves the teacher more freedom to select the specific contexts through which geographical knowledge and understanding can be developed; these may include Earth science contexts, but rarely prescribed in any detail.

For ages 5–7 teaching is not subject-based, so any fieldwork will be holistic and include aspects of science, geography, history, English, etc. It can be readily seen how the science and geography are interlinked at this level, as exemplified in the Foundation Phase in the new curriculum in Wales.

For ages 7-11 teaching may become more subject-based, but fieldwork is still likely to be integrated and include aspects of many subjects. Again it can be readily seen how the science and geography are interlinked at this level; for example a visit to a disused sand and gravel quarry would include not only the geological features, but also soils, natural and planted vegetation, animals (wild and introduced), and land use, including recreation.

Even for 11-16 year-olds, it has to be recognised that RIGS sites will often contain educational opportunities within Geography as well as Science that go beyond the geological features. This should be seen as a definite benefit to the conservation and use of the RIGS site, and not as a potential conflict of interests. However, there is more emphasis in the Geography curriculum on human geography for this age range. In England and Wales there is no Geography National Curriculum laid down for 14-16 year-olds, and examination specifications (syllabuses) vary considerably as a result.

The importance of geomorphological sites to Geography teachers should focus the attention of local RIGS groups on the identification of geomorphological sites as well as the geological exposures. There are many more Geography teachers and Geographical Association local groups than the equivalent for Geology, and it is important to recruit these numbers to the RIGS cause.

Most teachers of Geology and Geography are experienced field teachers, and their teaching sites are often likely to be actual or potential RIGS. They are the most likely source for recruitment as experts on educational assessment of sites to advise local groups.

Contact your local branch of the Geographical Association, and discuss the selection of geomorphological sites, especially where your local RIGS group lacks geomorphological expertise. Contact the relevant teachers in your local schools and colleges.

10.3.5 RIGS and Earth science in the curriculum

This is not the place to discuss the ways in which specific aspects of the Earth science within the school curriculum can be delivered through the use of RIGS. For a detailed discussion of the use of fieldwork opportunities to support teaching in schools and colleges, a website called Fieldwork Knowledge Library has been developed by the Institute of Education (London University) and the British Ecological Society. This provides a vast resource of ideas of how fieldwork can be used across all the sciences. They point out that besides a significant amount of Earth science within Science and Geography, Earth science also has a contribution to make in Citizenship, Design and Technology, and Education for Sustainable Development (ESD).

Throughout all such developments, strong advocacy by local RIGS groups of the educational potential of RIGS has a major part to play in the success of the RIGS movement.

Study the approaches suggested on the Fieldwork Knowledge Library website at www.fieldworklib.org to match the fieldwork opportunities identified there with the opportunities available within your local RIGS. Exemplars of how to use fieldwork opportunities for schools at RIGS and other geoconservation sites, with appropriate documentation, have been developed by the UKRIGS Education Project – Earth Science On-Site, and may be downloaded from esos.ukrigs.org.uk. Other relevant websites are listed in Appendix 10.2.

It has to be understood that schools work under a rigid timetable structure, particularly in secondary schools, which limits the use of field teaching for any year group. This time restriction means that any field visit must deliver all the desired outcomes effectively within a tight time schedule, planned months or even a year in advance.

It is essential that sites are thoroughly assessed for their educational potential at the appropriate level, so that teachers can select the most suitable sites for their purposes, given the long timescales required for planning.

10.3.6 RIGS in post-16 and higher education

Many RIGS groups will empathise with the needs of these sectors, and will relish the task of assessing and evaluating sites for this level of use.

Students of Geology and other subjects at GCE A level, Scottish Higher Level and undergraduate level with an Earth science component such as Geography and Environmental Science require access to high-quality geological and geomorphological sites. These must provide the key features needed for field teaching, specialist study, and individual research projects. At postgraduate level, some taught courses have similar though more specific requirements. These will be more familiar to many professional and amateur geologists involved in the RIGS movement than the requirements for use by school Science and Geography, so no further elaboration is needed here.

With restricted budgets for fieldwork the use of sites near to an institution is an important consideration for post-16 and first year undergraduate fieldwork. However, sites for postgraduate research need protection from overuse and damage by others, especially large parties of enthusiastic collectors! The protection offered by RIGS designation is important in identifying and conserving such high quality teaching locations.

The assessment and evaluation of sites for use in tertiary and higher education is more specialised. They must be more than good examples for field teaching; greater emphasis is placed on the detail of the geological evidence provided by the site, and how this relates to the geology of the larger area.

Some may feel they need to call in expertise from the tertiary or higher education sectors to help in site assessment, evaluation and interpretation. Approach your local higher education establishments to discover what expertise and help may be available. This expertise may lie not just within Earth science, Geology and Geography departments, but also in Education departments and a range of other sciences.

The Open University Geological Society (OUGS) in particular has a number of regional groups who provide fieldwork opportunities for enthusiastic adult students and graduates. Many RIGS groups draw active members from these OUGS groups.

If not done already, contact your regional OUGS group. Hopefully such approaches will be met with an enthusiastic response from those who should be particularly sympathetic to the RIGS cause!

10.3.7 RIGS and courses in geoconservation

A recent development in the educational use of RIGS and SSSIs has been the introduction of modules in geoconservation in some first and higher degree courses. Among the universities that offer such modules are:

Chester	Edinburgh	Staffordshire
Derby	Liverpool Hope	Wolverhampton
Edge Hill	Queen Mary (London)	Worcester

Others await confirmation.

10.3.8 RIGS, education and the amateur geologist

Geology is a popular amateur pursuit for large numbers of people, either individually or through local societies (many affiliated to the Geologists' Association), and particularly through adult education groups. For most, their needs are in many ways similar to those of secondary education and first year undergraduates. However, a minority of enthusiasts become deeply involved, and their interests have more in common with those of postgraduate research. As with the OUGS, this is a useful area for recruiting members for RIGS groups. Many are already involved in the task of site assessment and evaluation, and later in the ongoing tasks of site interpretation, conservation and management. Such people may also be an important source of educational expertise, as they are likely to include many teachers of subjects other than Geology and Geomorphology.

It may well be that amateur geologists are your most likely recruits to be the enthusiastic and dedicated 'custodians' of your RIGS!

10.3.9 RIGS, and the public

The public are increasingly attuned to the idea of nature conservation, but most people do not include Earth science in this category. Even for those in the wildlife conservation movement, the idea of geological heritage as part of natural heritage has only recently become generally accepted. Many display boards and leaflets have been produced which promote this awareness and benefit the public and amateur alike. In areas of high scenic value our geodiversity is a major tourist attraction. Such areas of geotourism are ripe for interpretation at all levels.

RIGS groups have an important part to play in the promotion of public awareness of our national, regional and local geological and geomorphological heritage, leading to the message that:

Geodiversity underpins biodiversity

[Statement first published by Burek C. V. 2001, Non-geologists now dig Geodiversity, *Earth Heritage*, (16) 21.]

There are several organisations which already promote this awareness, including Government, statutory agencies (Natural England, Scottish Natural Heritage, the Countryside Council for Wales, Earth Heritage Service for Northern Ireland), The National Trust, National Park Authorities, Geoparks, Museums, quarrying operators and local community heritage groups.

RIGS groups should include such bodies in their LGAP partnerships.

This is education as life-long learning at many levels, from politicians and government officials to the general public.

The public are also the long-term source of recruitment to the ranks of amateur geologists, and, particularly in the case of parents, of a more general enthusiasm for geology and geomorphology that can improve the image of Earth sciences in the next generation. One of the main ways in which RIGS groups can help this change of perception is by involving the public in activities on RIGS sites.

Think of ways of achieving contact with the community at all levels from politicians to the proverbial “man in the street”. Use the annual National Science Week as an opportunity - you may be able to obtain funding for this. You could organise:

- *events at your best, most accessible sites, or at your local museum,*
- *interpretation of sites through display boards, leaflets and guided visits,*
- *a notable field leader or speaker.*

Ensure that your local councillors and planning office are aware of their obligations to consult you, and that they establish a working relationship with your LGAP Partnership.

10.3.10 RIGS and the young

Rockwatch, hosted by the Geologists' Association, has harnessed and organised a notable depth of enthusiasm in large numbers of young people outside formal education. Their activities across the country range from field trips to 'fun days', often using RIGS sites known to their leaders. Others such as the National Trust, National Parks, the Scout and Guide movements, the Duke of Edinburgh Award Scheme and youth clubs are engaged in similar activities at appropriate levels. For all these a system of well-documented RIGS sites of educational value could provide an invaluable resource.

Local Rockwatch groups and others may be willing to run events at your local sites, which will all help in the promotion of the RIGS movement through partnerships. On the other hand, your group may wish to offer their services to youth groups who lack the expertise.

The opportunities are there - it is the imagination, energy and enthusiasm of members in local groups that are needed to make it all happen.

A publication by the Earth Science Teachers' Association called 'Steps Towards the Rock Face - Introducing Fieldwork' is designed as a resource for teachers undertaking geological fieldwork at this level. A copy of this booklet can be downloaded from: www.ukrigs.org.uk [click Downloads].

Use the opportunity of local family and community events to promote the work of your RIGS group.

10.4 Educating the educators

There are two key issues for enabling successful educational use of RIGS by school groups:

- introducing teachers, and in particular non-specialist science teachers, to the use of RIGS,
- training appropriate enthusiasts from the RIGS movement to do this.

The enthusiastic RIGS trainer must understand the needs of the learner and the role of the teacher. Such training is not about in-depth exploration of the geological interpretation of the site - it is about the use of the site to fulfil learning objectives that stem from the school curriculum. It should highlight the way in which a site, no matter how simple or complex, can be used to observe, record and interpret basic Earth science concepts.

Many teachers often need to develop their own basic knowledge and understanding of Earth science before they are confident and competent to visit a RIGS site with a school group for field teaching. The trainer has to be able to ignite an enthusiastic response from the teacher for the Earth science involved, so detailed analysis of a site using technical language is NOT appropriate.

The exemplar RIGS teaching and learning materials already created by the UKRIGS Education Project - Earth Science On-Site (ESOS) are being supported by short (typically half-day) on-site training sessions for non-specialist teachers. UKRIGS have initiated this at several sites and hope to be able to continue, as funding allows.

Information about these training sessions may be found on the UKRIGS website and also on the ESTA and Association for Science Education (ASE) websites. The ASE website may be found at www.ase.org.uk.

Training the trainers

This is a specialist area in its own right, and the RIGS movement should organise its provision for this purpose at a regional or national level. Short courses given by experienced teachers with appropriate backgrounds and supported by RIGS members are needed. National training courses focusing on the educational use of RIGS sites would enable the development of best practice to be then shared across the RIGS movement. This will require an organisational framework for its implementation, with further conferences and seminars to maintain the impetus. Existing partnerships with others involved in the field of Earth science education, notably ESTA and ESEU, are essential to achieve all this.

Courses for science teachers

Specialist initial teacher training for Earth scientists is available at only two institutions, Bath and Keele Universities. In-service courses are provided by numerous organisations, but few are able to address the Earth science component. The annual ESTA conference, usually held in September each year, has an in-service day with courses for primary and secondary teachers, and also provides courses as part of the Annual Meeting of the ASE, held in January, and, for primary teachers only, at the Geographical Association Conference held at Easter.

The Earth Sciences Education Unit (ESEU), sponsored by Oil and Gas UK (formerly UKOOA) and supported by ESTA, is based in the Education Department at Keele University. It gives support and in-service training in Earth science to science teachers in secondary schools in England and Wales, and for primary school teachers in Scotland, England and Wales. One of their training units is entitled 'Earth Science Out-of-Doors'. The ESEU website may be found at www.earthscienceeducation.org.uk.

Science education in England is served by regional Science Learning Centres, who provide occasional courses relating to Earth science, mostly based on ESEU and ESTA modules.

Appendix 10.1: Useful references

Curriculum documents

[Note: some links provided on this page may fail to open as direct links, and will need to be typed directly into your browser address bar]

Documents for the National Curriculum in England and Wales, 5-16, are available on the internet at National Curriculum Online: www.nc.uk.net

This site has useful links to the sites for Scotland, Wales and Northern Ireland at the foot of the Home Page, but they may be accessed independently:

Northern Ireland: Council for the Curriculum, Examinations and Assessment at www.ccea.org.uk

Scotland: Learning and Teaching Scotland at: www.ltscotland.org.uk includes links with The Scottish Qualifications Authority at: www.sqa.org.uk and The Curriculum for Excellence Scotland, at: www.curriculumforexcellencescotland.gov.uk

Wales: Welsh Assembly Government – Department for Education, Lifelong Learning and Skills: <http://new.wales.gov.uk/topics/?lang=en> Topics: Education and skills. Download the revised curriculum for 3 to 19-year-olds in Wales, to be implemented from September 2008

For England, the relevant government website for the Department for Children, Schools and Families (formerly the Department for Education and Skills) is still at www.dfes.gov.uk. The Schemes of Work for the National Curriculum in England are available from www.standards.dfes.gov.uk/schemes3

The Qualifications and Curriculum Authority (QCA) has responsibility for regulating, developing and modernising the curriculum, assessments, examinations and qualifications in England: www.qca.org.uk

Examination Board Syllabuses/Specifications for GCSE/Advanced/Advanced Supplementary levels in England, Wales and Northern Ireland are available from the five major examination boards from the relevant web sites:

- Assessment and Qualifications Alliance: www.aqa.org.uk
- Council for the Curriculum, Examinations and Assessment [Northern Ireland]: www.ccea.org.uk
- Edexcel: www.edexcel.org.uk
- Oxford, Cambridge and Royal Society of Arts (OCR): www.ocr.org.uk
- Welsh Joint Examinations Council: www.wjec.co.uk (In Welsh, select www.cbac.co.uk)

For details of the curriculum in the Irish Republic, go to the National Council for Curriculum and Assessment, Dublin at www.ncca.ie

Background to the Educational Use of RIGS:

The government manifesto (July 2007) for learning outside the classroom can be downloaded from: www.teachernet.gov.uk/learningoutsidetheclassroom

Department for the Environment, Food and Rural Affairs (DEFRA): the full text of 'Local Sites Guidance on their identification, selection and management (April 2006)' may be found at www.defra.gov.uk/wildlife-countryside/ewd/local-sites/.

On the same site may also be found the details of the Local Sites Seminar: 'Taking Forward the Guidance' held on 25 January 2007, in Birmingham. which includes the text of a presentation of 'The Educational Potential of Local Sites' by Reynolds, J.R.

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Appendix 10.2: Useful Contacts and their teaching resources

Earth Science Teachers' Association (ESTA): www.esta-uk.org

ESTA aims to encourage and support the teaching of Earth sciences, whether as a single subject such as Geology or as part of Science or Geography courses. It represents teachers at all levels, from primary to higher education. There is a conservation policy which actively seeks to encourage its members to become involved in RIGS groups and general site conservation. Experienced members can provide advice and in-service training.

ESTA publishes a quarterly journal, Teaching Earth Sciences, containing ideas for classroom, laboratory and field teaching, updating articles and news items. There is an annual conference held in different locations, usually in September.

ESTA liaises with the Department for Children, Schools and Families (formerly DfES), the Qualifications and Curriculum Authority (QCA), The Geological Society (GS), The Association for Science Education (ASE), The Geologists' Association, The Geographical Association and the Royal Society and of course UKRIGS to promote the effective teaching of Earth science.

The Earth Science Education Unit (ESEU): www.earthscienceeducation.org.uk

ESEU is sponsored by Oil and Gas UK (formerly UKOOA) and supported by ESTA, is based in the Education Department at Keele University. It gives support and in-service training in Earth science to science teachers in secondary schools in England and Wales, and for primary school teachers in Scotland, England and Wales. One of their training units is entitled 'Earth Science Out-of-Doors'.

The Geographical Association: www.geography.org.uk

This GA is the national subject teaching organisation for all geographers, and has local branches in England, Wales and Northern Ireland. The Association publishes three quarterly journals, aimed at primary teacher, secondary teacher and academic audiences respectively. There is an annual conference held at different locations at Easter.

Scottish Association of Geography Teachers: www.sagt.org.uk

The Association publishes an annual academic journal and three issues of 'Scottish Geography Newsletter'. The annual conference is held at the end of October.

Association for Science Education: www.ase.org.uk

The ASE is the largest subject teaching organisation in the UK, serving a membership of science teachers of all disciplines at all levels from primary to tertiary. ASE publications include 'Education in Science', 'School Science Review' (mainly for secondary teachers), and 'Primary Science Review'. There is an Annual Meeting in early January, held at different locations, and regular regional and local section meetings throughout the year.

Joint Earth Science Educational Initiative: www.esta-uk.org/jesei

JESEI has brought together a major resource for in-school practical work for Earth science, some of which may be suitable for field use at RIGS.

Earth Science Education Forum (England and Wales): www.bgs.ac.uk/esef

ESEF has links to other educational organisations in England and Wales

Scottish Earth Science Education Forum: www.scottishgeology.com

SESEF has a wide range of resources and links to other sites related to the Scottish curriculum, and to Scottish geology in general. This site will be of interest to those elsewhere in the UK.

Learning and Teaching Scotland: www.ltscotland.org.uk

LTS publishes a number of resources for the Geology Curriculum in Scotland for post-16, including some simulated fieldwork studies which give useful insights into how teachers approach field teaching and learning. This useful information is applicable for the whole of the UK.

Field Studies Council: www.field-studies-council.org

FSC run day and residential field courses at 17 centres across the UK for teachers and students in a range of subject areas. They produce a wide range of materials to assist with fieldwork at different levels. Use the website to link to individual centres.

British Geological Survey: www.bgs.ac.uk

BGS, the national geological mapping agency, has strong links with the RIGS movement and has a wide range of background publications and resources for teachers, including virtual field trips.

The Geologists' Association: www.geologists.org.uk

Founded in 1858, the GA is an association of amateur geologists supported by professionals. The national organisation and its local groups and affiliated societies hold regular indoor and field meetings. The GA is often a key partner for local RIGS Groups, with frequent visits made to RIGS sites.

Rockwatch – The club for young geologists: www.rockwatch.org.uk

Rockwatch is the nationwide club for young geologists. It is the junior club of the Geologists' Association and is open to all those interested in things geological – rocks, fossils, minerals and landscape. In addition to a useful file of geological information, a magazine and competitions, youngsters (and their parents) are encouraged to take part in activities and field trips. Many of these will be to RIGS sites or SSSIs. Children and parents are often hooked for life! For full details, go to the website.

The Geological Society of London: www.geolsoc.org.uk

The GeolSoc was founded in 1808 as the society for professional geologists. It has a few fieldwork resources for schools.

The Open University Geological Society: www.ougs.org

The OUGS, founded in 1972, has a large membership of both amateur and professional geologists. Through its regional structure it offers a wide range of field visits throughout the UK and to many places abroad. With their wide experience, any members and OU staff are involved in site and educational aspects of RIGS work.

National Parks: www.nationalparks.gov.uk

National Association of Areas of Outstanding Natural Beauty: www.aonb.org.uk

Individual National Parks and AONBs have educational activities for formal and informal education involving Earth science fieldwork. Check the national websites for individual website details.

The National Trust (England, Wales and Northern Ireland):

www.nationaltrust.org.uk/geology

The National Trust (England, Wales and Northern Ireland) was founded in 1895 for Places of Historic Interest or Natural Beauty was set up to act as a guardian for the nation in the acquisition and protection of threatened coastline, countryside and buildings. Large areas of upland were granted to or purchased by the Trust over many years. In the 1960s, Enterprise Neptune raised awareness of the threats from urbanisation and industrialisation to coastlines of great beauty, and great rocks! Large stretches of coastline have subsequently been conserved for posterity. The Trust is one of the biggest landowners in the UK, with 248,000 hectares in its care.

The Trust is becoming more involved in the active management of its geological properties, including many SSSIs and RIGS sites. The website and Handbook give some details on a regional basis. In 2007 they published their Geological policy and Geological collecting policy, available to download. They have long been involved with school groups visiting historic buildings and now cater for schools seeking outdoor education activities, including Earth science fieldwork.

In Shropshire the Trust runs school fieldwork based at Cardingmill Valley and Knowle Quarry on Wenlock Edge. For booking details go to: www.cardingmillvalley.org.uk . The latter is one of the UKRIGS Education Project sites. An informal education project at Ilam in Staffordshire is “Jackson’s Geology”, an interactive facility, which displays and prints out geological fieldwork materials related to the South Peak.

The National Trust for Scotland: www.nts.org.uk

The National Trust for Scotland was set up in 1931. and owns some 78,000 hectares.

Look on the websites for future developments.

Natural England: www.naturalengland.org.uk

NE has developed Nature for Schools: lesson plans, activities and information on a county basis, including ideas for field activities. On the website, click on *Researchers, Students and Teachers*.

Scottish Natural Heritage: www.snh.org.uk

SNH has a range of and links to background publications and resources, with some related to fieldwork available for downloading.

Countryside Council for Wales: www.ccw.gov.uk

CCW offers little support for teachers seeking Earth science resources

Environment and Heritage Service of Northern Ireland: www.ehsni.gov.uk

EHSNI offers little support for teachers seeking Earth science resources.

National Stone Centre: www.nationalstonecentre.org.uk

The NSC provides booked guided school visits on-site, with several activities, including investigating the Millennium Wall and fieldwork in a Lower Carboniferous reef. It has a display on the Story of Stone.

UNESCO: www.unesco.org

For links to World Heritage Sites and International Year of Planet Earth.

The Jurassic Coast World Heritage Site: www.jurassiccoast.com

This World Heritage site has a wide range of educational resources available for downloading, including Teachers' Powerpoints [www.swgfl.org.uk/jurassic] Its education services include outdoor education opportunities and teacher training events.

Giant's Causeway Visitor Centre: www.giantscausewaycentre.com

Mainly information for the general public and has links to other organisations, e.g. The National Trust: www.nationaltrust.org.uk

European Geoparks Network: www.worldgeoparks.eu

Has links to individual geopark websites.

Each geopark has range of educational activities and materials for schools and tourists, with calendar of events for schools.

Quarry Products Association: www.qpa.org

The QPA is the organisation for the quarrying industry. With help from companies it has produced a range of resources including an interactive educational programme called "Virtual Quarry": www.virtualquarry.co.uk

Natural History Museum: www.nhm.ac.uk

The NHM has many activities for children based on its collections, including fossils and other Earth science topics. The Real Earth Science Project is planned to link museums, schools and teachers with activities inside and outside the classroom.

Museum Net: www.museums.co.uk

The national website to find museums in England and Wales. Many museum personnel have long been involved in RIGS work.

Scottish Museums Council: www.scottishmuseums council.org.uk

The national website to find museums in Scotland.

English Heritage: www.english-heritage.org.uk

EH has a range of resources on the built environment.

There are now many examples of good geological Teaching Trail Guides, and also some addressing geomorphology. Some have already been produced by individual RIGS Groups and reported in the **UKRIGS Newsletter**. For websites of these groups, go to the UKRIGS website at: www.ukrigs.org.uk

Earth Heritage Magazine, published jointly by JNCC, NE, SNH and CCW, has many reports and articles on the educational use of SSSIs and RIGS. Check for available downloads from: www.seaburysalmon.com Click on Publications.

Down to Earth, published by GeoSupplies Ltd, has up-to-date reports on topics of geoconservation and educational interest. These include details and reviews of new leaflets and other publications. Go to www.geosupplies.co.uk

Appendix 10.3: UKRIGS Education Project – Earth Science On-Site

The final appendix of the first edition of this handbook was a blank space with the title UKRIGS Exemplars. We were acutely aware of the need to produce high quality field teaching materials for non-specialist teachers. In 2004 UKRIGS was successful in obtaining DEFRA/ALSF funding for a pilot project at four former aggregate sites in Staffordshire and Derbyshire. This led to a second project, based on eight aggregate sites further afield, but restricted to England. Our third project continues the work.

Regular progress reports have been published in several journals, including the UKRIGS Newsletter, Teaching Earth Sciences, Earth Heritage Magazine and occasional articles elsewhere.

A similar project to use RIGS sites for Education in North Wales, by ESTA/CCW colleagues Cathie Brooks and Alwyn Roberts, has used ESOS materials as exemplars. The report: Using Field-based Geodiversity Information in Schools, is available from CCW. A presentation is available on the ESEF(Cymru) website: www.bgs.ac.uk/esef/cymru

In Scotland SESEF are planning the Earth Science Fieldwork Resource Initiative which will develop the use of Scottish RIGS sites for educational purposes.

Individual RIGS groups have begun to take the initiative in respect of their own sites. These include Tees Valley at Saltburn and Black Country at Barr Beacon. Such a response to the UKRIGS exemplars is one of the anticipated outcomes of the Project.

The Project report to UKRIGS AGM October 2007 gives full details:

UKRIGS Education Project – Earth Science On-Site

Funded by DEFRA's Aggregates Levy Sustainability Fund,

Administered by Natural England

The UKRIGS Education Project, Earth Science On-Site 2005-07 followed on from a very successful pilot project. It has succeeded in its prime objective of producing high quality Earth science field teaching activities for schools at a further eight former aggregates sites across England. The materials have been produced in collaboration with partners in the Earth Science Teachers' Association [ESTA], the Earth Science Education Unit [ESEU] and the National Stone Centre [NSC]. They have been devised to address the requirements of the National Curriculum at Key Stage 2 [7-11 yrs], KS3 [11-14 yrs] and KS4 [14-16 yrs to GCSE].

PURPOSES OF THE PROJECT

The purposes of the project are:

- to encourage non-specialist science teachers to undertake Earth science fieldwork with pupils from primary to GCSE level;
- to demonstrate the educational value of RIGS and SSSI sites to local planning and education authorities, to the aggregates industry and to the wider public community;
- to foster the wider use of RIGS and SSSI sites by providing teaching materials as exemplars that may be adapted for use at similar sites elsewhere;
- to provide links between these field teaching activities and the classroom or laboratory practical activities produced by the Earth Science Teachers' Association, www.esta-uk.org, the Earth Science Education Unit, www.earthscienceeducation.org and other partners, hosted on the Joint Earth Science Education Initiative website, www.jesei.org

EARTH SCIENCE ON-SITE – The Site Materials: esos.ukrigs.org.uk

The materials for each site include the following information to assist group leaders and teachers when planning field activities. Separate versions of items 3 to 6 are available for the appropriate Key Stage:

1. Introductory note explaining the background to the project;
2. Map and details of location, access and initial risk assessments;
3. Background information relating to the site and its geological and geomorphological interest;
4. Details of National Curriculum links and Attainment Targets addressed at Key stages 2, 3 or 4, and the requirements of the specifications of the various GCSE examination boards;
5. Suggested links for appropriate preparatory and follow-up work, including CD animations;
6. Materials to support field activities, including teacher notes, worksheets, reference material and related items. Although use is made of specific terms, they are written for appreciation by a wider, less technical, audience.

It is anticipated that teachers, and others, will use the materials as exemplars, and freely adapt them to their own context and their own programmes of study.

The selected sites are designated RIGS or SSSI, mostly having open access or owned by public bodies.

SUMMARY OF TEACHING MATERIALS FOR THE TWELVE SITES IN ENGLAND [2004 – 07]:

1. National Stone Centre [SSSI], Wirksworth, Derbyshire

Lower Carboniferous tropical reef environments can be observed in the limestones of this large site. The Millennium wall has a wide variety of rock types and building styles.

- KS2:** A teaching trail, with activities investigating the use and identification of rock types seen on-site, including the Millennium Wall, plus fossils and minerals.
- KS3:** Based largely on the rock cycle, use is made of the Millennium Wall to investigate rock types, interpret their origin, the effects of weathering and their use as building stone.
- KS4:** An investigation using the evidence found in the different types of limestone to determine that this was a reef environment in Carboniferous times.

2. Black Rock RIGS and Dene Quarry, Matlock, Derbyshire.

Namurian gritstone exposure displays sedimentary features and there is an adjacent lead mine dump. The spectacular view into the active Deane Quarry is a bonus.

- KS2:** An extension of a visit to the National Stone Centre, to include the view into Dene Quarry. Black Rock site too specialised at this level.
- KS3:** Dene Quarry view and display panel gives an opportunity to look at the processes and development of quarrying Carboniferous Limestone for aggregates. The impact on the local community and environment is considered. Black Rock extension of NSC work on the rock cycle and identification and use of rocks.

KS4: Dene Quarry view and display. In-depth consideration of the environmental impacts of aggregates quarrying and effects on the local community. Black Rock, Cromford Moor Mine dump: Identifying minerals present as evidence for lead mining. Visit the adjacent Barreledge Quarry and surrounding area to investigate the uses made of the gritstone.

3. Apes Tor and Ecton Hill [Hamps & Manifold SSSI], Wetton, Staffordshire

Thin, muddy Ecton Limestones of the Lower Carboniferous are tightly folded, giving an excellent locality to study the geometry of fold structures. Ecton Hill itself has the remains of copper mining and periglacial features.

KS2: Site too specialised at this level.

KS3: Foot of Ecton Hill: Activities related to the rock cycle, including gravity on mine dump and scree, river erosion, transportation and deposition. View exposures of muddy Carboniferous Limestone. Best used as revision activities before looking round the corner for KS4 activity.

KS4: Apes Tor. Activities centre on investigating the folding of rocks, including modelling using card and foam strips. A CD animation sequence demonstrates folding and the completion of a field sketch records much detail. Uses of these limestones are investigated.

4. Park Hall CP [Hulme Quarries SSSI & NNR], Stoke-on-Trent, Staffs

Lower Triassic sandstones and pebble beds reveal a story of flash floods in a desert environment, with subsequent uplift, tilting and faulting.

KS2: A Teaching Trail has key localities to investigate the Triassic sandstones and pebble beds, including identification of pebbles using reference sheet. Consideration is given to the uses made of the sand and gravel.

KS3: Investigation of the environment of deposition. Sandstones, pebble beds and cross-bedding structures give evidence for flash floods in desert environment during Triassic times. A CD animation demonstrates the formation of cross-bedding under flowing water and field sketches record the evidence.

KS4: Revision of KS3 material is encouraged by following the trail, building up a picture of the events prior to the faulting, Evidence is sought to determine movement on the fault, helped by a CD animation and field sketch.

5. South Elmsall Quarry SSSI, nr Doncaster, West Yorkshire

Magnesian Limestone, Permian, showing reef structures in the dolomitic limestone.

KS2 and 3: Site too specialized at these levels.

KS4: An investigation using the evidence found for the environment of deposition of reefs in shallow seas with high evaporation rates.

6. Dryhill Picnic Site RIGS, nr Sevenoaks, Kent

Hythe Beds, Lower Greensand, Cretaceous, showing gently folded hard limestones [Kentish rag] and soft sandstones [hassock].

KS2: A teaching trail, with activities to test properties and identify rock types seen on-site and investigate their sedimentary origin. Linking weathering of rocks to the formation of soil and growth of plants.

- KS3:** Investigate part of the rock cycle found in this locality, including deposition in a marine environment, uplift, folding and subsequent weathering and erosion.
- KS 4:** Interpreting the mode of formation of the rocks and subsequent deformation by mapping the fold structures to visualize the 3D geometry.

7. Ercall Quarries SSSI, Telford, Shropshire.

The features of this extensive site include the unconformity between Precambrian igneous rocks and Cambrian marine sediments, with later intrusions and faults.

- KS 2:** A teaching trail based on identifying the range of hard aggregates extracted from the quarries and the evidence for their igneous or sedimentary origin.
- KS 3:** Investigate the origin of the rocks found here and the unconformable relationships with each other, as part of two separate rock cycles.
- KS 4:** More detailed investigation of rocks and relationships, with additional work on ripple marks and faulting.

8. Barrow Hill RIGS, & St Mark's Church, Pensnett, Dudley, West Midlands

Barrow Hill is a dolerite intrusion into Coal Measures, showing columnar jointing and contact with overlying sedimentary rocks. Adjacent is St Mark's Church built of sandstone, with range of rock types in the churchyard, gate and war memorial.

- KS 2:** St Mark's Church area is used to identify a range of rock types and to study the effects of weathering. The Church shows cracks from the 2002 Dudley Earthquake. The igneous origin of the dolerite at Barrow Hill is investigated, with the link to soil formation and use of geological resources.
- KS 3:** St Mark's Church area is used to investigate in more detail rock types and weathering. The use of stone in walls, including furnace slag, is linked to the use of geological resources in the area. The Barrow Hill dolerite is demonstrated to underlie the Dudley volcano.
- KS 4:** No materials have been written for this level.

This site was visited by delegates from the UKRIGS Conference in September 2006.

9. Tedbury Camp Quarry RIGS and Vallis Vale SSSI, Frome, Somerset.

Both quarries show the angular unconformity between the Carboniferous Limestone and Inferior Oolite, with the eroded platform extensively burrowed by bivalves.

- KS 2:** A teaching trail, based on Tedbury Camp, has activities to identify the two limestones, the unconformity and their formation. The weathering of rocks is linked to the formation of soil and growth of plants.
- KS 3:** Investigate the origin of the two limestones found at both localities and the unconformable relationships with each other, as part of two separate rock cycles.
- KS 4:** More detailed investigation into the wider structural context of the Carboniferous Limestone. An investigation of the ecology of the Jurassic sea floor as demonstrated by the unconformity surface.

Materials for this site were trialled by delegates from the ESTA Conference, in September 2006.

10. Ryton Pools Country Park RIGS, adjacent to Wood Farm Quarry RIGS, Bubbenhall, Warwickshire.

A Quaternary channel fill in the Baginton gravels - Baginton sands - Thrussington Till sequence is exposed and is being conserved. The best section is in the active Wood Farm Quarry, which will not have open public access for about a year. A viewing platform is planned for the Ryton Pools site.

KS 2: As well as investigating the origin of the sediments, the teaching trail makes the link with soils and vegetation at Ryton Wood. A visit to the Martha Methane exhibition shows the use of the site for waste disposal.

KS 3: The link is made to the parts of the rock cycle observed here, from the changing environment of the Quaternary to modern weathering and erosion. The underlying Triassic Mercia Mudstone is used to retain the waste on site.

KS 4: No materials have been written for this level.

11. Mosedale Quarry RIGS, School House Quarry and adjacent glacial gravels, Mungrisedale, Penrith, Cumbria

Mosedale Quarry is in the Carrock Fell Gabbro. School House Quarry is in the Loweswater Flags [Skiddaw Formation] with dolerite dykes. Quaternary scree and outwash gravels are also exposed.

KS 2: A teaching trail is based on the identification and use of local rocks in buildings and walls, linking them to quarries in the vicinity.

KS 3: An investigation of a range of rock types at several sites, including igneous, sedimentary and metamorphic. Included is a study of gravels from different recent environments, linked to the rock cycle.

KS 4: Includes an exercise to interpret the geology from evidence found in Schoolhouse Quarry and a detailed study of gravels from scree, esker and modern river deposits.

12. Meldon Aplite Quarries SSSI, Okehampton, Devon

The 20m dyke of aplite has metamorphosed the Carboniferous rocks. There is a wide variety of rock and mineral types present.

KS 2: A teaching trail includes the identification of local rocks used in walls and buildings, and investigates some of these rocks in exposures.

KS 3: Includes work on the rock cycle, including movement of boulders under cold conditions. An investigation of the evidence to show the intrusion of aplite and dolerite into sedimentary rocks and the effects of metamorphism.

KS 4: No materials have been written for this level.

Work in progress 2007 – 08

We have received the go-ahead for further site work on the Project.

The Northumberland coast at Boulmer and Snableazes Quarry in the Great Whin Sill provide useful sites, as does Knowle Quarry on Wenlock Edge. Local RIGS Groups are involved and anyone is welcome to contact us.

Part of the wider project involves training non-specialist teachers in the use of these sites and how to adapt the materials for use at other geoconservation sites. The ESEU method of training teachers by using facilitators in face-to-face practical sessions has worked well in the laboratory/classroom situation. A similar approach to field teaching activities is planned for several sites, taking the UKRIGS Education Project forward, not only with teachers and RIGS Groups, but beyond, in the National Trust and others with an interest in Earth science education.

The revision of Chapter 10 [RIGS and Education] of the RIGS Handbook is planned. This will include details of the UKRIGS Education Project and other resources which have become available since 2001.

We have made a start in our aim of addressing the serious problems of schools failing to undertake Earth science fieldwork, highlighted in English Nature Report 523 - *The use of geological sites by schools*. The Department for Education and Skills has recently sent out encouraging messages about the need for fieldwork in schools in their *Education outside the classroom manifesto*. Such messages and our products are certainly needed, but we have some way to go.

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