Chapter 5 Practical Geological Conservation Review selection methods

Site selection criteria

The three essential components of the Geological Conservation Review are explained in Chapter 4. Practical guidelines were also developed so that Geological Conservation Review sites can be selected from the range of candidate sites.

First, two operational criteria are employed.

- there should be a *minimum of duplication* of interest between sites
- it should be *possible to conserve* any proposedsite in a practical sense.

All scientific factors being equal, sites that cannot be conserved, or which entirely or largely duplicate the interest of another, are excluded. Sites that are least vulnerable to potential threat, are more accessible and are not duplicated by other sites are preferred.

Preference is given to sites that:

- demonstrate an assemblage of geological features or scientific interests
- show an extended, or relatively complete, record of the feature of interest. In the case of geomorphological sites, this often equates to sites that contain features which have been least altered after formation (e.g. Kildrummie Kames, Inverness District; (Figure 57)). For Quaternary networks, this might relate to sites containing an extended fossil record, including pollen, insects and molluscs. This can be used to infer vegetation history or environmental change
- have been studied in detail and which have a long history of research and re-interpretation;
- have potential for future study
- have played a significant part in the development of the Earth sciences, including former reference sites, sites where particular British geological phenomena were first recognised, and sites which were the focus of studies that led to the development of new theories or concepts.

Application of these criteria ensures that sites chosen for a particular network in the Geological Conservation Review have the greatest collective scientific value and can be conserved.

Minimum number and minimum area of sites

In order to ensure that Geological Conservation Review site status is confined to sites of national importance, the number of sites selected is restricted to a reasonable minimum. Only those that are necessary to characterise the network in question, that is to demonstrate the current understanding of the range of Earth science features in Britain for the network, are selected. These factors are important in the justification of the scientific value of a Geological Conservation Review site if it is to be subsequently designated a Site of Special Scientific Interest. For example, the scientific case for conserving a given site is stronger if it is the only one of its kind, or if it is demonstrably the best of a set of similar examples (Figure 58).

The area of a Geological Conservation Review site is always kept to a minimum. For example, in tracing the form of a major structure over a distance of several kilometres, a small number of dispersed, representative 'sample' sites might be selected — the minimum number and size required to describe and interpret the feature adequately. There are, however, exceptions to this general rule: for example, large sites will be required to represent the range of large-scale glacial landforms in the uplands of Wales or Scotland. In contrast, mine spoil heaps, typically of limited size, normally form relatively small sites.

Methods and working practice

Site selection procedures within the Geological Conservation Review

The process of site assessment and selection for the Geological Conservation Review was led by Nature Conservancy Council staff supported by several hundred Earth scientists contracted to assess sites within their particular area of expertise.

The starting point for this process was to devise a comprehensive classification of blocks (*see* (Figure 56)) to subdivide the geology and geomorphology of Britain into a series of subject areas. Work on particular blocks typically followed four stages.

Stage 1: Building and briefing the block team

For the larger blocks, a co-ordinator (a specialist member of the Nature Conservancy Council or an external expert Earth scientist) was appointed to oversee the task of assessing and selecting the sites. The co-ordinator's role was to advise on site selection criteria and collate the work of a number of contributors who dealt with networks of sites within the block. For the smaller blocks, a single Geological Conservation Review contributor often undertook the work, in consultation with other experts within the field.

Stage 2: Literature review and site shor tlisting

The block co-ordinator or contributor then undertook an extensive literature search of both published and unpublished sources to create a list of all known Earth science sites of potentially national or international importance, relevant to the subject of the block. Where appropriate, early historical references to specific sites were researched so that potential sites from the earliest days of British Earth science could be considered for inclusion in the review.

Each of the sites on the draft list was given standard basic documentation (e.g. site location, brief summary of scientific interest, possible justification for inclusion within a network).

Draft lists were circulated among the appropriate experts for critical assessment and comment. Sites with significant research potential were considered. Following this peer review, a shortlist of candidate sites was drawn up. In the case of the Jurassic–Cretaceous Reptilia Block, 380 potential Geological Conservation Review sites were identified from the literature as potentially special; this number was reduced to about 150 after first-stage sifting.

Stage 3: Field visits and detailed site investigation

Shortlisted sites were usually visited by the block co-ordinator or relevant expert to assess and validate the scientific interest.

Following the initial field visits, the list of potential sites was refined further by the co-ordinator, in liaison with the specialist advisers for the block. At this stage, sites where significant deterioration of the features of interest had taken place were usually dropped from the list. In some cases it proved necessary to clear exposures of vegetation and soil, or to sample them remotely, for example by augering, before an assessment of potential could be made. This was particularly true of some historically important Quaternary localities.

Stage 4: Final assessment and preparation of Geological Conservation Review site documents

The draft list of potential sites was then reviewed and the sites were once again scrutinised against the selection and operational criteria. A final list of sites meriting inclusion within the particular Geological Conservation Review block was then prepared. From the list of 150 shortlisted potential Jurassic–Cretaceous Reptilia sites, a final list of 28 actual Geological Conservation Review sites was produced.

For each proposed Geological Conservation Review site the following documents were prepared:

- a site boundary enclosing the important features of the site, drawn on 1:10,000

- Ordnance Survey maps
- a concise statement of the scientific interest, typically between 100 and 200 words in length, an example of which is given in (Figure 59)
- a longer statement describing the scientific importance of the site and citing key references from the literature.

The statement and map form the basis of a key part of the documentation required to notify the Geological Conservation Review sites as components of the SSSI system under the *Wildlife and Countryside Act 1981*. The process of work stages applied in selecting sites for a Geological Conservation Review block is shown schematically in (Figure 60). SSSIs may contain more than one Geological Conservation Review site; an example is Durlston Bay, South Dorset, SSSI which contains six Geological Conservation Review sites (*see* information box on page 79).

The study of the Earth — continuing developments

The final concept to be considered is 'current understanding'. It is unlikely that the entire geological and geomorphological record will ever be fully understood. Given the speed of scientific change within geology, there is a continual need to re-survey to ensure that the Geological Conservation Review networks and sites reflect the current state of knowledge. The

Geological Conservation Review is, therefore, an ongoing process of refinement and update to ensure that conservation keeps pace with current understanding.

The physical character of sites is constantly being changed by weathering and vegetation growth. Some sites are lost to development, while other new exposures are created by quarrying and engineering works (Figure 61). Thus a site series is inherently dynamic and should be reviewed periodically. In practice, such reviews have resulted in only modest changes since 1990.

Geological Conservation Review sites within Sites of Special Scientific Interest

Geological Conservation Review sites within Sites of Special Scientific Interest

The 3002 Geological Conservation Review sites identified will be considered for notification as approximately 2300 SSSIs. The difference in numbers reflects the fact that Geological Conservation Review sites chosen as parts of different blocks may partly or entirely overlap geographically. A single SSSI may encompass several Geological Conservation Review sites, as well as one or more features of special biological value. The diagram below shows GCR site overlaps within a single hypothetical SSSI.

Durlston Bay SSSI, South Dorset, is a good example of a large composite site which incorporates separate and overlapping Geological Conservation Review sites. (Figure unnumbered 2) Photo: J.G. Larwood.

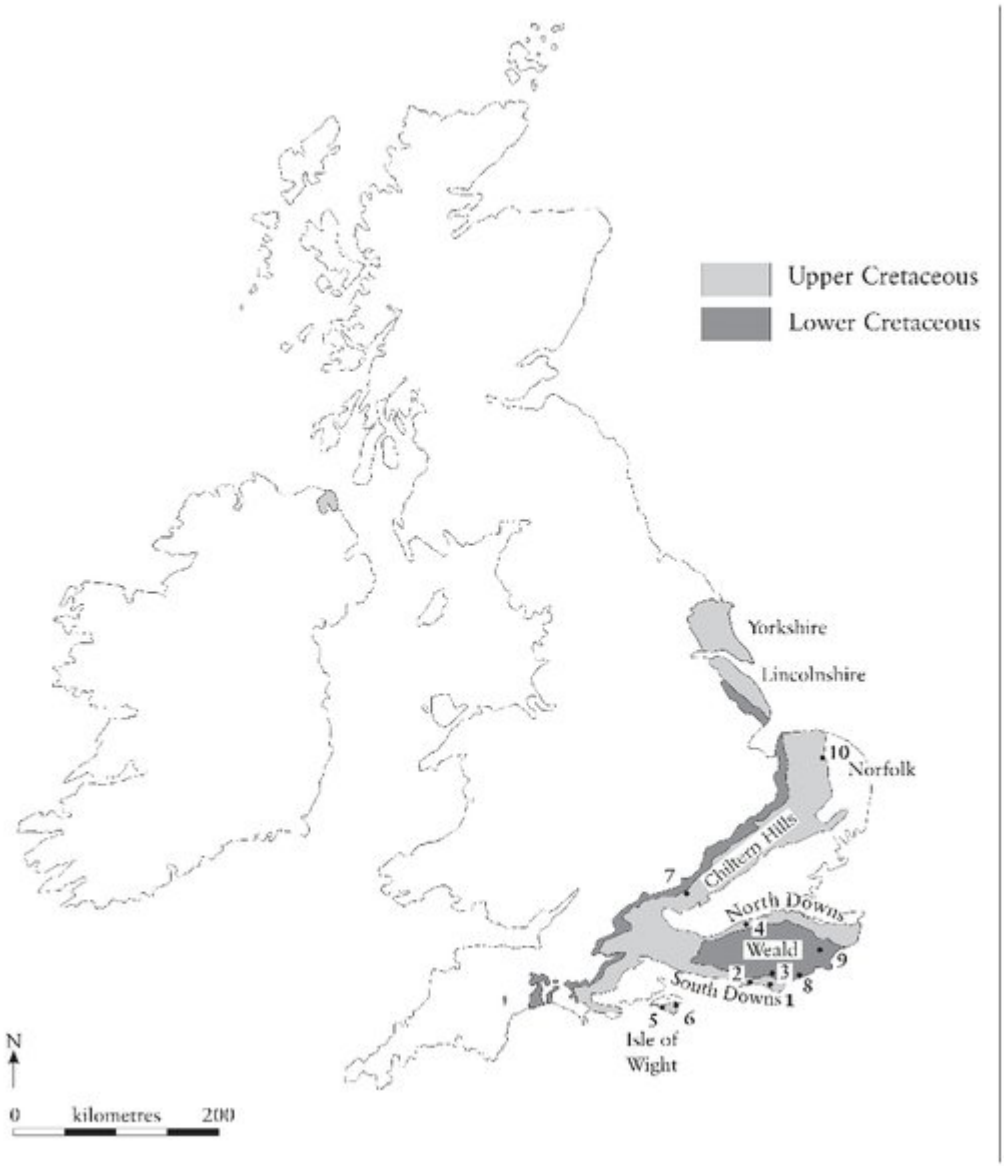
Special features of interest found at Durlston Bay have led to the sites' inclusion in six Geological Conservation Review blocks, as follows:

- Portlandian–Berriasian Stratigraphy
- Mesozoic Mammalia
- Palaeoentomology
- Mesozoic–Tertiary Fish/Amphibia
- Jurassic–Cretaceous Reptilia
- Coastal Geomorphology of England.

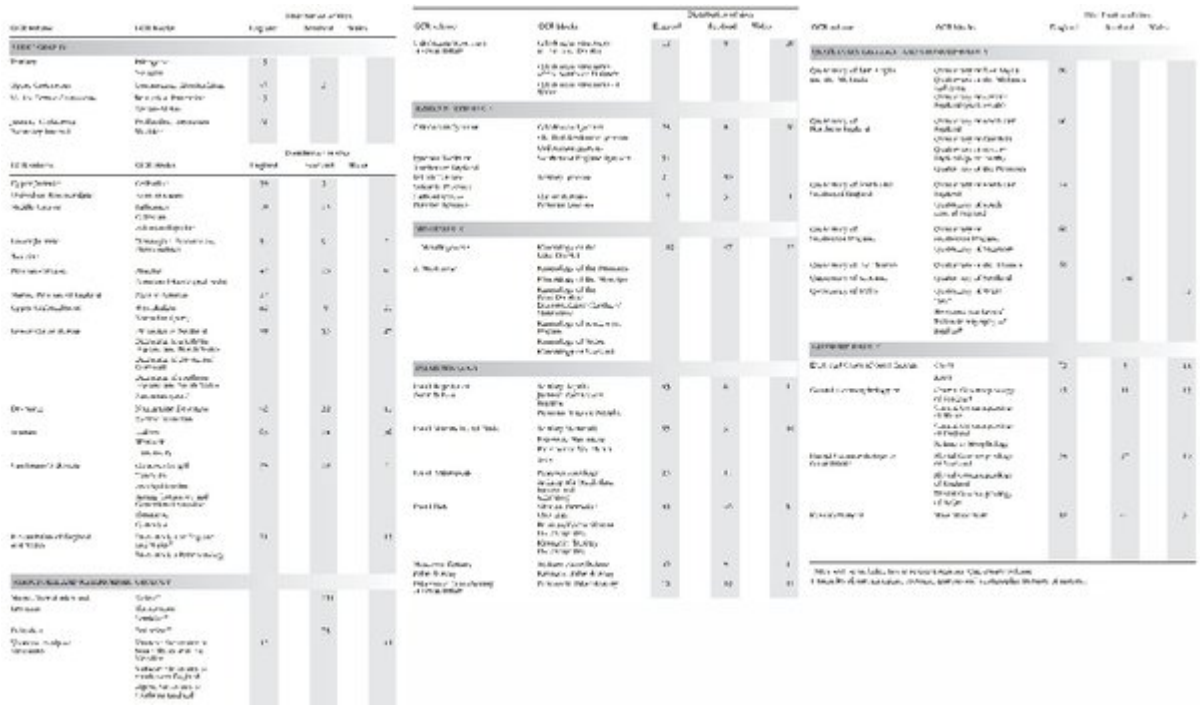
Each of the six Geological Conservation Review sites within the single Durlston Bay SSSI was assessed independently for inclusion within its respective network, and judged worthy of Geological Conservation Review status in its own right.

References and further reading

(Figure 57) Kildrummie Kames esker system, Inverness District, viewed towards the east. Two areas of braided ridges (right foreground and centre distance) are linked by a single ridge. These striking features were produced by glacial meltwater rivers at the end of the last ice age. Photo: Cambridge University Collection. Reproduced by permission of the Curator of Aerial Photography.



(Figure 58) Ten sites were selected for the fossil reptiles Cretaceous network in Britain to illustrate the range and diversity of reptiles of this period. Some 150 sites were considered as potential sites for this network. The sites not included as SSSIs may be conserved by other means, such as RIGS or local nature reserves.



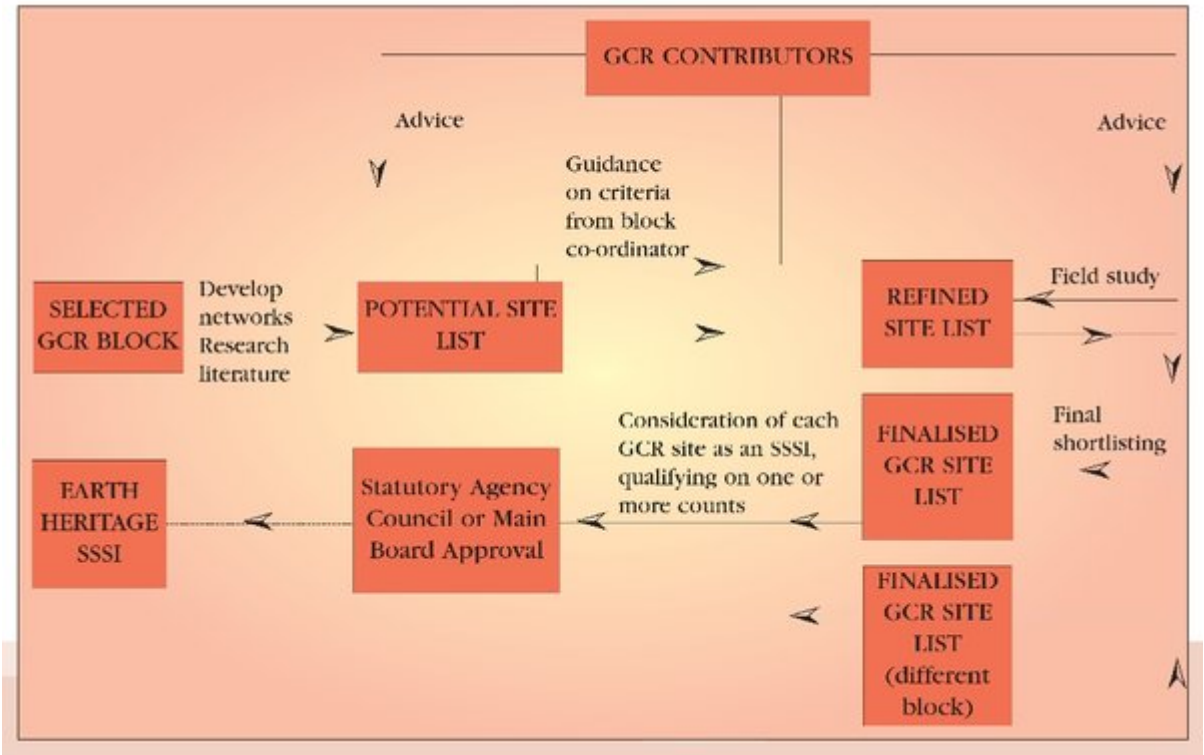
(Figure 56) List of blocks.

GCR BLOCK	Quaternary of Wales
NAME OF SITE	Dinas Dinlle
COUNTY/DISTRICT	Gwynedd
GRID REFERENCE	SH 437562

GCR INTEREST

Dinas Dinlle is an important coastal exposure for interpreting late Pleistocene glaciation in North Wales. The sequence comprises a complex series of Irish Sea and Welsh tills with associated sands, silts and gravels. It is complicated by well-developed glaciotectonic structures including folds, faults and overthrows, and by cryoturbation features which occur in the uppermost horizons. The sections have been regarded as showing the northernmost occurrence of Irish Sea till belonging to the oldest-known glacial episode in the area (the Trevor Advance), while the glaciotectonic structures have been interpreted as evidence for a later readvance of ice. However, recent research suggests that the sediments and glaciotectonic structures need not be the product of different glacial advances, but can be adequately explained as a multiple drift sequence formed during one glaciation. The drift sequence, and particularly the glaciotectonic structures, make Dinas Dinlle a site of significant interest for reconstructing late Pleistocene processes and events in North Wales.

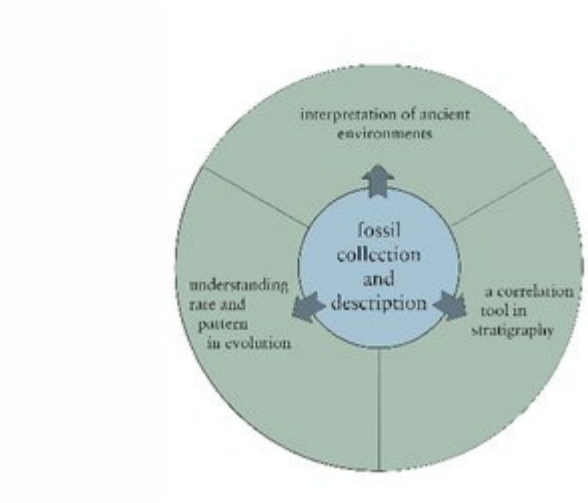
(Figure 59) Specimen citation.



(Figure 60) Flow diagram showing a typical site selection process within a GCR block.

(Figure 61) Florence Mine, Cumbria. Mineralogy of the Lake District Block. The importance of this site lies in its excellent exposures within the Beckerment iron ore body, the largest remaining of the iron ore 'flats' (an ore body that has replaced a sediment layer) of the West Cumbria mining province, and its contribution to research into ore mineralistaion in Britain. At the mine, the variety and form of the ore is displayed in situ. This site is one of seven chosen to represent the variety of iron ore deposits across Britain. It is the only one which shows iron ore replacement flats, a type of deposit unrecorded outside Britain. This site was recently added to the Geological Conservation Review. At the time of selection of Lake District mineralogy sites, no good in situ exposures were available at the surface, and a nearby mine dump site was the only available source of material for studying these unique deposits. Florence Mine now supersedes the mine dump site. The photograph shows the mine-roof of kidney ore. This part of the mine is to be conserved with the intention of using it as an educational/visitor resource, consequently no removal of in situ specimens is permitted by the mine management. Photo: T. Moat.

The photograph shows a fossil ammonite, Asteroceras obtusum, *from Charmouth, Dorset. Although superficially like a snail shell, it is actually the remains of a cephalopod. Modern relatives include the squid, octopus and* Nautilus. *Because of the relative abundance of ammonite fossils, and the relatively rapid evolution of different species, they provide useful 'markers' for comparing ages of rocks at different places. Photo: K. N. Page.*



(Figure unnumbered 2) Durlston Bay SSSI, South Dorset, is a good example of a large composite site which incorporates separate and overlapping Geological Conservation Review sites. Photo: J.G. Larwood.