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## Glossary

This glossary provides brief explanations of the technical terms used in the introductions to the chapters and in the 'conclusions' sections of the site reports. These explanations are not rigorous scientific definitions but are intended to help the general reader. Words in **bold** type indicate an internal reference to another glossary entry.

**Abrasion:** the process of mechanical wearing away of parts of rocks or **fossils** by **sediment**-laden water, air or ice. The process produces an increasingly smoothed and rounded outline shape.

**Absolute age:** the actual age of formation of a natural feature, rock or **fossil**, determined by **absolute dating**. Usually given as 'years **BP**', actually meaning years before AD 1950 by international agreement.

**Absolute dating:** a method of determining the **absolute age** of formation of a rock, mineral or fossil, by techniques such as radiocarbon dating.

**Accretion:** build-up or accumulation of **sediment**.

**Aeolian:** descriptive of **sediment** transported and deposited by the wind.

**Aggradation:** the building upwards of a river valley or floodplain by accumulation of **fluvial** deposits; can also be applied to material deposited by other agencies, such as wind or waves.

**Alluvial fan:** a cone-shaped deposit made up of waterlaid deposits, and also some material transported by mud flows.

**Alluvial:** a term applied to the environments, action, and products of rivers or streams. Alluvial deposits are composed of **clastic** material deposited in the river **floodplain**.

**Alluviation:** the process of the accumulation of material deposited by river water, usually located along the river valley and tending to be predominantly fine-grained silt or sand.

**Alluvium:** sediment transported and deposited by rivers.

**Anastomosing:** descriptive of a system that branches or contains a network; for example the channel pattern of a **braided** stream.

**Anthropogenic:** produced or induced by human activity.

**Anticline:** an arch-shaped upfold of rocks produced by tectonic activity (cf. **syncline**) with younger strata on the outermost part of the arch and older rock in its core.

**Arch:** a hollow cut by wave **erosion** through a rocky headland.

**Archipelago:** a group of islands.

**Arcuate:** arc-shaped.

**Arenaceous:** descriptive of **clastic sediments** made up of sand-sized particles, cf. **argillaceous**.

**Argillaceous:** 'clay', descriptive of fine-grained detrital **sediments** made of **silt**, or clay-sized particles, cf. **arenaceous**.

**Ayre:** a regional term used mainly in Shetland for a **tombolo** or a long narrow **spit** of **shingle** or **sand**, usually formed across a shallow bay or voe.

**Ball and low:** see **ridge and runnel**.

**Bar:** a low, elongated body of **sediment**, such as **sand** or **gravel** laid down in shallow water, built up by wave action offshore, and lying more or less parallel to the general coastline and sometimes attached to it; cf. **spit, tombolo**. Sometimes known as a 'barrier beach', where it emerges above high tide level.

**Barrier beach:** see **bar**

**Beach:** the strip of land along the margin of a body of water that is washed by waves or tides sufficiently to prevent all or most terrestrial plant growth.

**Beach feeding:** coastal engineering involving the importation of **sediment**, usually obtained from the seabed. Also known as beach nourishment, beach replenishment.

**Beach plain:** a continuous level or undulating area formed by closely-spaced successive embankments of wave-deposited beach material added more or less uniformly to a pro-grading shoreline.

**Beach ridge:** a low, rectilinear or curvilinear mound of beach or beach and **dune** material (**sand, gravel, shingle**) heaped up by wave action on the backshore of a **beach** above the present limit of storm waves or the reach of ordinary tides, and running roughly parallel to the shore.

**Bedding plane:** a planar feature in **sedimentary** rocks representing an original surface of deposition. Conspicuous bedding planes may indicate a short interruption in, or change in character of **sediment** deposition.

**Bedrock:** the rock, usually solid, underlying soil and other unconsolidated surficial material.

**Berm:** a gently inclined ridge of sediment at the top of the beach.

**Bio-erosion:** **weathering** and **erosion** resulting from the activities of animals.

**Biogenic:** descriptive of sediments that of biological origin, e.g. shellfish fragments

**Bio-geochemical cycling:** the movement of chemical elements from organism to physical environment to organism, in a more or less circular pathway. It is termed 'nutrient cycling' if the elements involved are essential to life. An element may be solid, liquid, or gaseous, or form different chemical compounds, in the various parts of the cycle.

**Blow-hole:** a hole in a cliff top leading to a sea cave, through which air is forced by the action of the sea.

**Blowthrough** (also **blowout**): A localized area of **deflation**, especially on a coastal **sand dune**. Deflation may have begun through the removal of vegetation by grazing animals or by trampling, or through the cutting off of sand supplies as new dunes develop near the shoreline.

**Bog:** ground that is waterlogged and spongy. It consists mainly of mosses and contains acidic decaying vegetation that may develop into

**peat.**

**Boulder clay:** see **till**.

**Boulder:** an unattached rock particle with a diameter of more than 256 mm.

**BP:** before present, see **absolute age**. **Brackish:** waters with salinities intermediate between fresh and marine.

**Braided channel:** a stream or river channel that branches frequently and rejoins after separation by **bars**.

**Braided river (braided stream):** a stream or river that divides into an interlacing network of several small branching and rejoining shallow channels, separated by **bars** or islands.

**Breaker zone:** the area between the outermost breakers (waves that have become too steep to remain stable, and are therefore breaking into foam near the shore) and the extent of wave uprush on the **beach**.

**Breccia:** a **sedimentary rock** consisting of angular pebbles (**cf. conglomerate**).

**Cainozoic Era:** the youngest era of geological time, spanning from approximately 65 million years ago to the present, and consisting of the **Tertiary** and **Quaternary periods**.

**Calcareous:** containing large quantities of calcium carbonate ( $\text{CaCO}_3$ ).

**Calcarenite:** **limestone** formed mainly of **sand-size** calcium carbonate fragments.

**Carboniferous:** a geological period from about 345 to 280 million years ago; rocks formed in this period in the British Isles are characterized by a lower marine **carbonate** sequence and upper marginal marine and terrestrial sequences containing coal deposits.

**Carr:** a regional term (mainly used in north-east England and south-east Scotland) for a **reef**; also a term for a mire with scrub dominated by alder and willow.

**Carse:** a Scottish term for areas of emerged or land-claimed estuarine flats.

**Catchment:** a term often synonymous with drainage basin; the area that collects the water flowing to a particular river; see **watershed**.

**Cave:** best defined as 'a natural cavity large enough to be entered by a person'. Most caves are formed by dissolution of **limestone** within **karst** landscapes, but others include sea, **glacier**, lava and **tectonic caves**. Sea caves can be defined as a hollow normally eroded in a **cliff**, with the penetration being greater than the width at the entrance.

**Cement:** the mineralogical 'glue' that holds particles together in **sedimentary** rocks.

**Chalk:** a poorly lithified, weak, friable and porous white **limestone**. Stratigraphically, *the Chalk* (a proper noun with a capital letter) is used synonymously in Britain with all of those rocks that formed during the Late **Cretaceous** Epoch.

**Chenier:** a ridge of **sand and** shells deposited at the **swash** limit on a **saltmarsh** or other coastal plain by a storm **surge**.

**Chine:** a sharply incised valley intersected by a sea **cliff**.

**Chert:** a fine-grained **silica-rich** rock that commonly occurs as nodules or bands within **limestones**.

**Clast** (adj. elastic): a sedimentary particle, usually larger than 4 mm diameter; a fragment of a pre-existing rock or **fossil** (*bioclast*).

**Clay:** very fine-grained **sediment**, **<0.004** mm in size; a soft very fine-grained **sedimentary** rock composed primarily of clay-sized particles.

**Cleft:** a **fissure** or **crevice**.

**Cleit:** a small unmortared drystone turf-roofed building peculiar to the St Kilda island group, used by the original islanders to store food and fuel.

**Cliff:** any slope steeper than **45°**.

**Climate change:** long-term trends or shifts in climate caused by natural mechanisms or by human activity.

**Climbing dune:** a **sand dune** formed by the piling-up of **sand** by wind against a **cliff** or hillslope.

**Cnoch-and-lochan:** a glacially scoured series of rock knolls and tarns

**Coastal Management Plan:** a plan that sets the management of a section of coast into its physical (erosion■deposition) and human contexts (planning, recreation) in order to minimize conflicts of interest between all coastal dunes. cf **shoreline management plan**.

**Coastal squeeze:** the process whereby, in the face of rising sea levels, an area of **intertidal** habitat, such as **saltmarsh**, mudflat or saline lagoon is prevented from migrating landwards owing to the presence of a hard boundary such as a sea defence or natural slope.

**Coastal zone:** the space in which terrestrial environments influence marine (or lacustrine) environments and vice versa. The coastal zone is of variable width, and may also change over time. Delimitation of zonal boundaries is not normally possible; more often such limits are marked by an environmental gradient or transition. At any one locality, the coastal zone may be characterized according to physical, biological or cultural criteria, which need not, and rarely do, coincide.

**Cobble:** a rock particle with a diameter of between 64 and 256 mm with a generally rounded or subrounded shape.

**Col:** the highest point on a divide between two valleys.

**Combe:** A short valley, especially in chalk areas. **Conglomerate:** a sedimentary rock consisting of rounded pebbles (cf. breccia).

**Contemporaneous:** formed or occurring at the same time.

**CORINE:** Co-ORdination of INformation on the Environment (a European Union biotopes classification initiative).

**Corrosion:** erosion by the mechanical pounding, scraping, and battering action of water or ice carrying pieces of rock, which wears away the land surface.

**Corrosion:** weathering by the wearing away of materials by chemical action. Corrosion usually involves the combined action of oxygen and water on a metal, and can be speeded by the presence of such substances as salt, acids, or bases, or air pollutants like sulphur dioxide.

**Corrie:** a Scottish term for a cirque, a deep, steep-walled, hollow in a mountain caused by glacial erosion; = cwm in Wales, = coire (Gaelic).

**Cove:** see **pocket beach**.

**Creek:** a **small** narrow inlet of the sea, longer than it is wide.

**Creep:** the slow mass-movement of material down relatively steep slopes, mainly under the force of gravity, but also influenced by saturation with water and alternate freezing and thawing; cf. **landslide**.

**Crenulate:** finely indented or notched.

**Cretaceous:** a period of geological time from about 142 to 65 million years ago.

**Crevice:** a narrow crack in a hard substratum <10 mm wide at its entrance, with the penetration being greater than the width at the entrance.

**Crystallization:** the formation of crystals or a crystalline structure.

**Cuesta:** an asymmetric ridge, with a steep slope on one side, and a shallow slope on the other.

**Current:** horizontal movement of water in response to meteorological, oceanographical and topographical factors; a steady flow in a particular direction. 'Current' refers to residual flow after any tidal element (**tidal streams**) has been

removed.

**Cusp (adj. cusped):** a complex depositional feature formed when **longshore drift** from two directions meets to produce a series of ridges at right angles to each other, forming a low-lying triangular foreland.

**Debris flow:** an avalanche-like break up and displacement of sediments down a slope, resulting in a chaotic jumble of fragments of different sizes in a muddy matrix.

**Deflation:** a process of surface-lowering (erosion) by wind action

**Delta (adj. deltaic):** a fan-shaped or irregular mass of **sediment deposited where** a river enters a lake or the **sea**.

**Dendritic:** a drainage pattern whose shape resembles the pattern made by the branches of a tree or veins of a leaf.

**Denudation:** the combined processes of weathering and erosion that wear down landscapes.

**Desiccation:** removal of moisture, which may produce desiccation cracks in the surface.

**Devensian:** the term for the last **glacial period** in Britain (maximum c. 18 000 years **BP**)

**Diagenesis (adj. diagenetic):** the alteration of the mineralogy and texture of **sediments** and **fossils** when they are close to the Earth's surface by chemical and physical processes; the term excludes metamorphic alteration.

**Differential weathering:** weathering that occurs at different rates, due to differences in composition and resistance of a rock and/or differences in the intensity of **weathering**.

**Dip:** the angle between a surface and a horizontal plane.

**Dissolution:** natural process of dissolving a solid; specifically in **karst** processes, the dissolving of **carbonate** rock to create a liquid solution of calcium and bicarbonate ions in water; also known **as solution**.

**Distal:** far from source.

**Drift:** a term used to characterize all unconsolidated rock debris transported from one place to another. *See also longshore drift.*

**Drowned features:** landscape features that are submerged as a result of changes in the relative levels of sea to land.

**Drumlin:** a low, rounded hill of **glacial till**, which was moulded into a streamlined shape by a **glacier** ice passing over it. Its long axis is parallel to the direction of flow of the **ice sheet** beneath which it formed.

**Dry-core dunes:** a **dune** system in which the **water table** is usually below the **deflation** level, so that standing water is rarely, if ever, found in the system

**Dry valley:** a fluvial valley cut by a **subaerial stream** or river then abandoned and left dry due to underground drainage, so that it now seldom, if ever, has water flowing along it in the form of a stream channel.

**Dune:** in the terrestrial environment, a mound or ridge of unconsolidated windblown **sediment**.

**Dune slack:** Flat-bottomed, hollow zone within a **sand dune** system that has developed over impervious **strata**. The slack may result from **erosion** or **blowthrough** of the dune system, and the flat base level is therefore close to or at the permanent **water table** level. Characteristically, dune slacks have rich, marshy flora, with willows (*Salix* species) as typical woody colonizers.

**Dyke:** a vertically or sub-vertically orientated band of rock. The term is generally applied to **igneous** rocks which have 'intruded' or 'cut through' pre-existing rocks, although **sedimentary** (Neptunian) forms occur.

**Ebb-tide:** outgoing or falling tide.

**Edge waves:** infragravity oscillations forced by resonance within within the surf zone. They interact with incoming waves to produce circulation cells whose currents transport sediment and may control net longshore movements.

**Embayment:** a type of marine inlet typically where the line of the coast follows a concave sweep between rocky headlands, sometimes with only a narrow entrance to the embayment.

**Emerged beach:** a former **beach** now situated above the level of the present shoreline as a result of earth movement, or changes in relative sea level. Also called a 'raised beach'.

**English Channel:** the arm of the Atlantic Ocean between southern England and northern France, linked with the **North Sea** by the Strait of Dover.

**Ephemeral:** short-lived, intermittent.

**Erosion surface:** a surface shaped by the processes of **erosion**.

**Erosion:** the wearing away of the land's surface by mechanical processes such as the flow of water, ice or wind; cf. **weathering**.

**Erosional notch:** a notch in a cliff resulting directly from erosional processes.

**Erratic:** a large **clast** left behind by melting ice and composed of rock not found locally.

**Esker:** a sinuous ridge of sand and gravel deposited by a **meltwater** stream flowing within a tunnel under a **glacier** or **ice sheet**.

**Estuary:** an inlet of the sea reaching into a river valley as far as the upper limit of tidal rise. (There are many alternative definitions of the term, most based on the dilution of seawater by freshwater derived from land drainage.)

**Eustatic:** concerning worldwide changes in sea level (as distinct from changes when land locally sinks into, or rises from, the sea). Eustatic changes of sea level may be caused by **ice ages** or may reflect periods of major **tectonic** activity.

**Eyes:** a Norfolk term for small inter-tidal ridges.

**Fan:** a low-lying accumulation of **sediment** with a roughly triangular outline. See **alluvial fan**.

**Fault:** a fracture within a rock along which there has been displacement due to **tectonic** deformation (e.g. **earthquakes**).

**Feeder bluff:** a term for a **cliff** undergoing **erosion**, which serves as a source of beach **sediments**.

**Fen:** see **bog**.

**Fetch:** the distance across water over which the wind blows from a particular direction uninterrupted by land.

**Fissure:** a fracture surface, or crack within a rock along which a clear separation can be seen. Often filled with material, frequently mineral-bearing.

**Fjord:** a series of shallow basins connected to the sea via shallow and often intertidal sills. Fjords are found in areas of low-lying ground that have been subject to **glacial** roughening. They have a highly irregular outline, no main channel, and lack the high relief and 'U'-shaped cross-section of Ordovician inlets.

**Fjord:** a long, narrow, steep-sided inlet of the sea having a shallow entrance sill. Fjords are **glacially** over-deepened and may have a series of sills and basins, often having deep water at the head. They are commonly surrounded by high ground, and, in cross-section, have a deep 'tr'-shape. See *also* glacial **valley**.

**Flagstone:** a hard, fine-grained **sandstone** that splits uniformly along **bedding** planes into slabs.

**Flandrian:** see **Holocene**.

**Flint:** a variety of chert, a hard, glassy and noncrystalline mineral form of silicon dioxide (quartz), frequently found in **carbonate** sediments, where it has developed from dissolved silica derived from sponges.

**Floodplain:** the level surface next to a river that is water covered during times of flood. **Flood-tide (or flow):** incoming or rising tide. **Fluvial: relating to** a river or river activity **Fluvioglacial:** See **glaciofluvial**.

**Flying barrier:** a looped **bar** or **spit** formed on the landward side of an island that is subsequently reduced below sea level by wave **erosion** before being destroyed.

**Fold:** a flexure in rocks.

**Foliation:** the planar arrangement of minerals, or other textural or structural features in rocks.

**Foredune:** A ridge of irregular **sand dunes**, typically found adjacent to **beaches** on low-lying coasts, and partially covered with vegetation.

**Foreshore:** the outer, or lower, seaward-sloping zone of a shore or **beach**. Also applied to the area of land between a body of water, and land that is occupied or cultivated.

**Fossil:** the preserved remains of animals and plants.

**Full:** a regional term for a **gravel beach ridge** in England and Wales.

**Gabion:** a wire basket, filled usually with stone, used for structural purposes such as retaining walls, **revetments**, slope protection, and similar applications.

**Gault clay:** a glutinous marine deposit of Early **Cretaceous** age found in south-eastern England and in France, containing abundant **fossils**.

**GCR:** see **Geological Conservation Review**.

**Geo:** (from Norse 'gja' meaning 'cleft') a northern Scottish term for a steep-sided narrow inlet of a cuffed coastline, often eroded along a major near-vertical **joint** or **fault**.

**Geological Conservation Review (GCR):** a review programme that assessed and selected nationally important geological and **geomorphological** sites in Great Britain with a view to their long-term conservation as SSSIs.

**Geomorphology:** the study of the landforms and the processes that formed them.

**Geotechnology:** the application of scientific methods and engineering techniques to the exploitation and use of natural resources.

**Glacial:** relating to the activity and presence of **glaciers** or ice.

**Glacial advance:** a time interval marked by an advance or expansion of a **glacier**.

**Glacial age:** a subdivision of a glacial epoch.

**Glacial cycle:** a major climatic oscillation of the order of 100 000 years, during which the ice sheets advanced and subsequently retreated and recurrent at fairly regular times.

**Glacial deposit:** a deposit or **drift** transported by **glaciers** or icebergs, and deposited directly on land or in the sea.

**Glacial drainage:** the system of **meltwater** streams flowing from a **glacier** or **ice sheet**. **Glacial drift:** see **glacial deposit**.

**Glacial epoch or period:** any period of geological time during which the climate was cold in both the northern and southern hemispheres and **ice sheets** and **glaciers** covered a larger total area than those of the present day.

**Glacial erosion:** the **erosion**, by, for example grinding, gouging and scratching, by the movement of a **glacier** with rock fragments within it, and also by **meltwater** streams.

**Glacial lake:** a lake fed primarily by the **meltwater** of a **glacier**, and found **beyond** the margins of the **glacier**.

**Glacial maximum:** the time or position of the greatest advance of a **glacier** or **ice sheet**. **Glacial recession:** a time marked by a decrease in the size and volume of a **glacier**.

**Glacial stage:** a major subdivision of a **glacial epoch**, for example one of the major cycles of growth and disappearance of the **Pleistocene ice sheets**.

**Glacial valley:** a deep, steep-sided U-shaped valley, influenced by a **glacier** that has widened and deepened a pre-existing river valley by **glacial erosion**. Sometimes called a 'glacial trough'.

**Glaciation:** a term to describe the formation, movement and recession of **glaciers and ice sheets**.

**Glacier surge:** a period of very rapid flow and growth of a **glacier**.

**Glacier:** a large body of ice formed in part on land by the compaction of snow, which moves slowly by **creep** downslope, or outwards in all directions under the influence of gravity.

**Glacio-eustatic:** relating to changes in sea level due to seawater being 'locked up' in **ice sheets** and vertical movements of the Earth's crust due to loading and unloading of the crust by the weight of the **ice sheets**. See eustatic.

**Glaciofluvial:** relating to the meltwater streams which flow from melting glacier ice, and to the deposits and landforms created by such streams, for example **outwash plains**.

**Glaciogenic:** of or relating to **glaciers and glaciations**.

**Glacio-isostatic:** relating to vertical crustal movements associated with the addition (causing crustal depression) and removal (leading to crustal uplift) of **glaciers**. See **isostasy**.

**Glaciolacustrine:** relating to **glacial lakes**.

**Glaciomarine sediments:** glacially eroded, terrestrially derived **sediments (clay, silt, sand, and gravel)** deposited in the marine environment. The sediments may accumulate by ice rafting, as an ice-contact deposit or by **aeolian transport**.

**Glaciotectonic:** the **deformation of rocks or sediments** caused by **glacial movement**.

**Gneiss:** a coarse-grained **metamorphic** rock, composed of alternating light and dark bands, formed at very high temperatures and pressures.

**Granite:** a pale-coloured, coarse-grained **plutonic igneous** rock, commonly occurring as large intrusions but also found in veins.

**Granule:** a sediment particle of very coarse **sand**, 2–4 mm diameter.

**Gravel:** sediment particles, the term used to describe beach sediments in the **pebble size** range, which may be formed from rock or shell fragments.



**Greensand:** a greenish **sandstone** consisting mainly of quartz and glauconite, deposited during the **Cretaceous** Period.

**Grit:** coarse, angular **sediment** particles.

**Groyne:** a **wall** or jetty built out from a riverbank or seashore, intended to combat the effects of **longshore drift** and control local **erosion**.

**Gully:** A vertical space between two rock walls, at least 0.5 m wide and 0.5 m deep.

**Hanging valley:** a tributary valley whose floor is higher than the floor of the main valley. Usually the result of **glaciation**, but also produced by marine **erosion leading** to cliff retreat.

**High Rock Platform:** a **shore platform** formed during the **Quaternary** Period and now found in Scotland at an elevation of c. 33 m **OD**, owing to a fall in sea level relative to the land.

**Hog's-back:** narrow, symmetrical ridge, underlain and controlled by a resistant **bed** dipping at some 40° or more.

**Holocene Epoch:** a geological time division; the most recent global epoch, which began approximately 10 000 years **BP** and is characterized by sea-level rise in all those places in Britain not affected by isostatic uplift. It is roughly equivalent to the European **Flandrian Stage**.

**Honeycomb weathering:** a form of chemical **weathering** in which numerous pits occur on a rock exposure, causing the surface to look similar to a large honeycomb. It typically occurs in arid regions, affecting granular rocks such as **sandstones** and **tuffs**.

**Hydrography:** the scientific study of seas, lakes and rivers (cf. '**hydrology**').

**Hydrology:** the study of the distribution, conservation, use etc. of the water of the Earth and its atmosphere (cf. '**hydrography**').

**Hydration:** Chemical combination of water with another substance, e.g. the addition of water to a mineral (such as anhydrite) to produce a hydrous phase (in this case, gypsum). Hydration may be important in the **weathering** of rocks.

**Ice Age:** a name often applied to the **Pleistocene Epoch** during which large areas were repeatedly covered by **ice sheets** and glaciers.

**Igneous:** a rock that has formed from molten rock (magma), either by volcanic activity or intrusive processes. It consists of interlocking crystals, the size of which depends on the rate of cooling of the magma.

**Interfluve:** an area of higher ground separating two river valleys.

**Interglacial:** a period of relatively warm climate between two episodes of **glaciation** where ice is in retreat.

**Interstadial:** a relatively short period within a major phase of **glaciation** when ice was not advancing and climate conditions were comparatively warm.

**Intertidal:** the area of the shore between the highest and the lowest tides; c.f. **littoral**.

**Irish Sea:** the area of sea between Great Britain and Ireland, from St George's Channel in the south to North Channel in the north, including all **estuaries** except the Firth of Clyde.

**Isostasy:** the condition of equilibrium, comparable to buoyancy, of the Earth's crust floating in the underlying layer (aesthenosphere) of the Earth. Crustal loading, for example by ice, water or volcanic flows, leads to isostatic depression, and the crust sinks deeper into the aesthenosphere. The removal of weight leads to isostatic uplift or rebound, and the crust rises. The depression and rebound occur over long timescales, of the order of thousands of years

**Joint:** a fracture in a rock that exhibits no displacement across it (unlike a **fault**). May be caused by shrinkage of **igneous** rocks as they cool in the solid state, or, in **sediments**, by regional extension or compression of **sediment** caused by earth movements.

**Jurassic:** a period of geological time, from 195 to 140 million years ago.

**Kame:** a low mound of stratified **sand** and **gravel** originally deposited on top of, or at the margin of, a **glacier** or **ice sheet** by **melt-waters**, and remaining as a topographical feature after the ice has melted.

**Karst:** a distinctive terrain created by **erosion** of a soluble rock, where the topography and landforms are a consequence of efficient underground drainage; characterized by **caves**, **sinkholes** and **dry valleys** and mainly developed on **limestone**.

**Kettlehole:** a depression in glacial or **glaciofluvial sediments**, resulting from the melting of a mass of **glacier** ice that was buried in sediment.

**Lacustrine:** relating to, formed within in, or produced by, lakes.

**Lagoon:** a shallow body of coastal saltwater (from brackish to hypersaline) partially separated from an adjacent sea by a barrier of sand or other sediment, or less frequently by rocks.

**Lamina** (pl. **laminae**): a thin layer within a **sedimentary** rock, typically less than 1 cm thick.

**Land-claim:** the process of creating usable land from flooded or intertidal land, usually involving impoundment and drainage.

**Landform:** a natural feature of the surface of the land.

**Landslide:** a large, rapid mass-movement of material down relatively steep slopes, mainly under the force of gravity, but also influenced by saturation with water and alternate freezing and thawing; cf. **creep**, **rockfall**.

**Last Glacial Maximum:** the time of the last great glacier advance, when **ice sheets** and **glaciers** reached their maximum thickness and extent. Dated to between 22 000 and 18 000 years **BP**.

**Late-glacial:** relating to the time of the end of the last glaciation of the **Pleistocene Epoch**, part of the **Devensian Stage**.

**Lateral moraine:** a low ridge-like moraine, built along on the side margin of a **glacier**.

**Lava:** molten rock extruded onto the Earth's surface, or the resultant solid rock.

**Leach:** to dissolve or remove from a soil or rock.

**Levee:** a broad ridge alongside a river or stream, deposited by floodwaters when they overtop the channel banks.

**Lias:** in Britain, a stratigraphical unit of rocks formed during the early part of the Jurassic Period.

**Limestone:** sedimentary rock composed largely of calcium carbonate ( $\text{CaCO}_3$ ) in the form of the mineral calcite, often derived from the shells of organisms, and soluble in weak acids including rain and soil water; strong, well-lithified limestones may stand in high vertical cliffs and can span large cave passages formed within them by dissolutational enlargement of fractures.

**Links:** relatively flat land along a seashore that is typically sandy and turf covered.

**Lithology:** descriptive of the constitution of a **sediment** or a rock, including texture, composition and colour, and size, shape and mineral composition of constituent crystals or **clasts** in the rock.

**Littoral:** the area of the seashore that is occupied by marine organisms that are adapted to, or need, alternating exposure to air and wetting by submersion, splash or spray; cf. **intertidal**.

**Loch Lomond Stadial:** a relatively cold period during the late glacial between 11 000 and 10 000 years **BP**.

**Lodgment till:** a **glacial** deposit laid down underneath an **ice sheet** or valley glacier. It is usually clay-rich and contains boulders.

**Loess:** a fine-grained **sediment** of windblown **silt** and **clay**, largely derived from cold **periglacial** deserts.

**Longshore drift:** movement of **sand** and **shingle** along the shore.

**Low:** inter-ridge hollow in southern England. See **swale**.

**Machair:** a type of coastal **dune** pasture on lime-rich sand, which has developed on a level coastal plain in wet, windy Atlantic seaboard conditions. Machair is globally restricted to north and west Scotland and western Ireland.

**Macro-tidal:** an **estuary** or other inlet with an average **spring tidal range** greater than 4 m.

**Managed re-alignment or 'retreat':** allowing the coastline to recede to a new line of defence (natural or man-made), usually accompanied by measures to encourage the development of environmentally beneficial mudflat or **saltmarsh** areas seaward of the new defence line.

**Marine regression:** the withdrawal of the sea from large areas of land, due to a fall in sea level relative to the land.

**Marine transgression:** the encroachment of the sea across large *areas* of land, due to a rise in sea level relative to the land.

**Mass movement:** the downslope movement of rock fragments and soil under the influence of gravity. The material concerned is not incorporated into water or ice, and moves of its own accord, but slides are often triggered by increase in water pressure on rocks and soil.

**Mass wasting:** the dislodging and transport of soil and sediment due to gravity. Processes include **solifluction** and rock-falls.

**Matrix:** the sediment, usually very fine-grained, which infills the spaces between larger grains.

**Meltwater:** water produced by the melting of snow and ice.

**Metamorphism** (adj. **metamorphic**): the process of alteration of **igneous** and **sedimentary** rocks by increases in pressure and/or temperature (but without melting) within the Earth's crust.

**Moraine:** a ridge of unsorted, unstratified **glacial till** deposited on top of or at the margins of a **glacier** or **ice sheet**.

**Morphology:** the form and structure of the landscape.

**Mud:** fine-grained **sediment** particles of **silt** and/or **clay** with a diameter of <0.0625 mm. **Mudflat:** an expanse of **mud** or muddy **sediment** in the **intertidal** zone.

**Mudflow:** The **mass movement** of fine-grained material held in suspension by water.

**Mudstone:** a very fine-grained rock.

**National Grid:** a metric grid used in maps, based on the Transverse Mercator Projection and developed by the Ordnance Survey for use in Great Britain.

**National Nature Reserve (NNR):** a site of national or international importance for nature conservation, declared under the National Parks and Access to the Countryside Act, 1949 and the Wildlife and Countryside Act, 1981.

**Naze:** a local term used in Essex for a headland.

**Neap tide:** the astronomical tide of minimum tidal range, occurring at the time of the first and third quarters of the moon.

**Negative surge:** the depression of sea level below Lowest Astronomical Tide by meteorological conditions; cf. **surge**.

**Neotectonic:** concerning tectonic (crustal) movements operating in the recent geological past (especially of Quaternary age) and those still occurring today.

**Ness:** a large low-lying **foreland** or promontory; also used in south-east England for a headland.

**Nothe:** a local term used in Dorset for a headland.

**North Sea:** the sea to the east of Great Britain, east of 4° W to the north of Scotland, north of 51° N at the Strait of Dover, and south of 61° N.

**Oceanography:** the branch of science dealing with the physical, chemical, geological and biological features of the oceans and ocean basins.

**OD:** see **Ordnance Datum**.

**Ord:** a term used in Yorkshire to describe areas of low, denuded beach that migrate along the direction of **longshore drift**, and are separated by fuller areas of beach.

**Ordnance Datum:** the fixed reference point for heights and contours shown on Ordnance Survey maps, which is based on mean sea level (MSL) as recorded at Newlyn (Cornwall) over a seven-year period from 1915 to 1921. This is not the same as chart datum, which is the set reference point on marine charts for water depth in relation to tides. On metric charts for which the UK Hydrographic Office is the charting authority, chart datum is a level as close as possible to Lowest Astronomical Tide (LAT), the lowest predictable tide under average meteorological conditions.

**Overflow channel:** an eroded trough cut by water spilling over from another channel or a standing water body like a lake.

**Overwash fan:** see **washover fan**.

**Oxidation:** the chemical process of removing electrons from an element or compound (e.g. the oxidation of iron compounds from ferrous to ferric); frequently together with the removal of hydrogen ions.

**Oxygen isotope analysis:** a method for estimating past ocean temperatures. The ratio of the stable oxygen isotopes,  $^{18}\text{O}$  and  $^{16}\text{O}$ , is temperature dependent in water,  $^{18}\text{O}$  increasing as temperature falls. Oxygen incorporated in the calcium-carbonate shells of marine organisms will reflect the prevailing  $^{18}\text{O}:^{16}\text{O}$  ratio.

**Oyces:** a Shetland term used to describe tidal lagoons enclosed by spits or barriers.

**Palaeosol:** an ancient or 'fossilized' soil.

**Palynology:** the study of microscopic plant fossils, such as spores, pollen, algal cysts and acritarchs and their distribution, which has proved to be of considerable use in correlating sedimentary deposits.

**Parabolic dune:** a sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, fixed by vegetation while the convex surface migrates downwind. Typically found where strong onshore winds supply abundant sand.

**Pea-shingle:** a clean **gravel**, the individual particles of which are similar in size to peas.

**Peat:** an unconsolidated deposit of semi-carbonized plant remains formed in a water-saturated environment, such as a **bog** or **fen**.

**Pebble:** a rock particle with a diameter of between 4 and 64 mm, typically implying a degree of rounding.

**Pedestal:** a thin neck or column of rock topped by a wider mass, produced by undercutting due to wind **abrasion** or differential **weathering**.

**Periglacial:** zone or environment peripheral to **glaciers**, so that it is very cold but is not covered by ice sheets, characterized by the action of intense frost, often combined with largely permanently frozen ground known as 'permafrost'.

**Piping:** natural subsurface channels of different sizes, which can form an interconnecting network, often in soils with significant amounts of swelling **clays**.

**Planation surface:** a term used in Britain to describe a fairly level plain resulting from prolonged **erosion** by rivers, slope processes, marine **erosion**, or other types of erosional activity.

**Planation:** the process of **erosion** by which the surface undergoing erosion becomes flat or level.

**Platform:** see **shore platform**.

**Pleistocene:** the first epoch of the Quaternary Period, from about 1 800 000 to 10 000 years ago, composed of alternations of great cold with stages of relative warmth, and sometimes referred to as **the Ice Age**.

**Plunging cliff:** a **cliff** that descends directly in to deep water.

**Pocket beach:** a beach contained within bounding headlands; a cove.

**Postglacial:** referring to the time interval since the total disappearance of glaciers at middle latitudes.

**Preglacial:** referring to the time prior to a **glacial** period. Also said of material underlying glacial deposits.

**Progradation:** the seaward-migration of a shoreline.

**Quartzite:** a **metamorphic** rock formed from more or less pure quartz **sandstones**.

**Quaternary Period:** a geological time division ranging from about 1.8 million years **BP** to the present day, it is the latest period of geological time, and the second period of the **Cainozoic Era**. It is divided into two epochs, the **Pleistocene** and the Holocene. See '**Ice Age**'.

**Radiocarbon dating:** a method of ascertaining the age of a sample by measuring amounts of carbon-14 ( $^{14}\text{C}$ ) within organic material. The method is based on the assumption that upon removal from the Earth's carbon cycle (for example when an organism dies), carbon-14 content is 'frozen', and then the proportion reduces over time through radioactive decay; by measuring the relative abundance of stable and radioactive carbon in a sample and knowing the decay rate of carbon-14 the elapsed time can be calculated.

**Raised beach:** see **emerged beach**.

**Ramsar site:** a site designated under the international Convention on Wetlands of International Importance especially as Waterfowl Habitat ('the Ramsar Convention').

**Recurve:** a landward-curving sand or gravel ridge produced by the successive extension of a **spit**.

**Reef:** (1) a ridge of rock or coarse material, the top of which lies close to the surface of the sea, and may be exposed at low tide; (2) an elevated structure on the seabed built by **calcareous** or other concretion-forming organisms, or by chemical precipitation; (3) an artificial structure deliberately constructed or placed on the seabed with the intention of influencing the local environment, for example to enhance fisheries or to absorb wave energy.

**Refraction:** the change in the approach angle of a wave as it moves towards the shore. As water becomes shallow, waves slow down. Refraction causes waves to converge on headlands and diverge in bays, concentrating wave energy on headlands rather than on beaches.

**Regolith:** unconsolidated, weathered, broken rock debris, mineral grains, and superficial deposits that overlie unaltered bedrock. Regression: see marine regression

**Relict:** descriptive of a geological or geomorphological feature surviving in its primitive form, i.e. no longer actively forming or evolving.

**Revetment:** a facing of rocks, sandbags, etc., intended to protect a coastline from erosion.

**Ria:** a drowned river valley in an area of high relief; most have resulted from the post-glacial rise in sea level relative to the land.

**Ridge and runnel:** multiple broad intertidal **bars** and **swales** running parallel to the coastline, the ridge crests typically being spaced at intervals of about 100 m, with an amplitude of about 1 m.

**Rill dissection:** the erosion of soil by water running through little streamlets, or head-cuts, forming rills, or small **gullies**.

**Rockfall:** a type of mass-movement where coarse material moves rapidly downwards from one part of the slope to another.

**SAC:** see **Special Area of Conservation**.

**Saltmarsh:** an area of **alluvial** or **peat** deposits, colonized by herbaceous and small shrubby terrestrial vascular plants, almost permanently wet and frequently inundated with saline waters.

**Saltpan:** a small, shallow, undrained, natural depression containing a salt deposit produced by the accumulation and subsequent evaporation of water; or a shallow pool of somewhat salty water occupying such a depression. They are flooded at high tide, and remain bare of plants because evaporation makes the trapped water hypersaline.

**Sand:** particles in the size categories 0.062 mm diameter (very fine-grained sand) to 4 mm diameter (granules).

**Sand dune:** see **dune**.

**Sandflat:** an expanse of **sand** or sandy **sediment** in the **intertidal** zone.

**Sandstone:** a **sedimentary** rock made of **lithified sand**.

**Sarn:** a Welsh word for 'causeway', used in west Wales for a roughly linear boulder or cobble reef derived from glacial moraine, lying at shallow depth (maximum depth about 10 m below chart datum), and completely covered at low tide.

**Scar:** Lag deposits of boulder and cobble dominated areas in the **intertidal** zone produced by erosion of glacial till.

**Scour:** the effect of abrasion, usually by water-or wind-borne sand or gravel, on a surface.

**Scree:** see **talus**.

**Seabed:** the sea floor.

**Sea loch:** a marine inlet in Scotland that has gordic or fiardic features, entered by the tide (on each cycle), and with a salinity generally greater than 30 ‰. Brackish conditions may be periodically established, particularly in the surface layers.

**Sediment budget:** the inputs of sediments from various sources minus the outputs to various sinks. Can be positive (implies accretion) or negative (undergoing erosion)

**Sediment cell:** a compartment of coastline, divided from neighbouring sections of coast in terms of **longshore drift**, **current** flow, and wave convergence and divergence. Also known as 'coastal cell' or 'coastal processes cell'.

**Sediment:** loose material derived from the **weathering** and **erosion** of preexisting rocks, or from biological activity (e.g. shells and organic matter) or from chemical precipitation (e.g. **evaporites**).

**Sedimentation:** the process of settling of suspended solid particles from water by gravity.

**Sedimentary rocks:** rocks formed by the **lithification** (cementation) of sediment. Sedimentary rocks may be composed of mineral or rock particles (clasts) to form sandstones, claystones or sediments of biological origin to form limestone and peat, or of chemical precipitation to form evaporites.

**Shale:** a fine-grained sedimentary rock, composed of clay particles, that splits easily into thin layers.

**Shell-sand:** a **sediment** comprising predominantly shell fragments of sand-size.

**Shingle:** beach **pebbles**, normally well-rounded as a result of abrasion.

**Shoal:** a mound or other structure raised above the seabed in shallow water that is composed or covered by, unconsolidated material and may be exposed at low water.

**Shore platform / intertidal platform:** a surface forming a level rock platform in the **intertidal** zone. Sometimes referred to as a 'wave-cut platform', but others can be levelled by weathering or may be structurally controlled.

**Shoreline management plan:** a plan that focused on the management of coastal erosion and defence, usually within a coastal sediment cell.

**Sidereal year:** the time required for one complete revolution of the Earth about the Sun (c. 365.25 days).

**Significant wave height:** the mean height of the highest one third of all waves.

**Silt:** fine-grained **sediment** particles ranging from 0.004–0.0625 mm in size.

**Site of Special Scientific Interest (SSSI):** an area of land or water notified by the statutory nature conservation agencies under the Wildlife and Countryside Act 1981 (as amended) as being of special nature and/or geological conservation importance; the principal designation under which **GCR** sites are protected.

**Skerry: (pl: skerries):** low-lying rocky island or reef often without terrestrial vegetation, and frequently swept by the sea.

**Slope-over-wall:** a cliff form characterized by a convex upper profile and a vertical or sub-vertical lower profile. Formed by periglacial processes followed by sea-level rise, which trims the lower cliff.

**Slump:** contorted structures produced by the **mass-movement** of unconsolidated sediment.

**SPA:** see **Special Protection Area**.

**Special Area of Conservation (SAC):** a site of European Community importance designated by an EU Member State under the 1992 Habitats Directive 92/43/EEC for the conservation of natural habitats or species listed in Annexes I and II of the Directive. These SACs, together with **Special Protection Areas** (SPAs) classified under the 1979 Birds Directive

79/409/EEC, collectively form the Natura 2000 Network. Most SACs above low-water mark are underpinned by **Sites of Special Scientific Interest**.

**Special Protection Area (SPA):** a site of environmental importance recognized at a European level, classified by an EU Member State under the 1979 Birds Directive 79/409/EEC on the conservation of wild birds. These SPAs, together with **Special Areas of Conservation (SACs)**, designated under the 1992 Habitats Directive 92/43/EEC collectively form the Natura 2000 Network. In Britain most SPAs above low-water mark are underpinned by **Sites of Special Scientific Interest**.

**Spit:** a low, elongated accumulation of **sediment** such as **sand** or **shingle**, projecting from the shore into a water body; cf. **bar, tombolo**.

**Spring tide:** the astronomical tide of maximum **tidal range**, occurring at or just after new moon and full moon. The most marked spring tides (equinoctial springs) occur at the spring and autumn equinoxes.

**SSSI:** see **Site of Special Scientific Interest**.

**Stack:** (from Gaelic 'stac') a pillar of rock formed by wave action, often when a sea **arch** collapses.

**Strandplain:** a prograded shoreline built seawards by waves and **tidal streams** or **currents**, and continuous for some distance along the coast.

**Strata:** (singular: **stratum**): layers within **sedimentary** rocks. The term is often used instead of 'beds'.

**Strait:** any deep (>5 m depth) tidal channel between two bodies of open coastal water. Strictly, a strait is the stretch of water between an island and its mainland (or adjacent islands).

**Strath:** a Scottish term for a broad level-floored river valley.

**Stratigraphy:** the study of rock successions and their distribution in space and time preserved from the geological past, in order to reveal the history of the succession of events and life of the past.

**Stump:** the rock mass that remains after a **stack** has been worn down.

**Subaerial weathering:** the normal processes of **weathering** that loosen rock fragments and transport debris downslope; in the intertidal zone, it may affect rocks down to the level of permanent saturation.

**Subcell:** a subdivision of a **sediment cell**.

**Submerged coast:** a former coastline that is preserved underwater, following submergence by rising sea levels relative to the land.

**Surge:** the elevation of sea level above Highest Astronomical Tide by low pressure meteorological conditions, also known as a 'storm surge'; cf **negative surge**.

**Swale:** a long, narrow depression, approximately parallel to the shoreline, between two ridges on a **beach**, and draining through transverse channels as the tide falls. A component of ridge and runnel topography. See *low*.

**Swell:** sea waves that have left the area where they were generated by the wind, or that have remained after the generating wind has disappeared.

**Talus:** an accumulation of rock litter at the foot of a slope, generally with a wide size-range (up to several metres) and ungraded; commonly used to denote debris shed from the high part of a reef slope and transported basinward by gravity ('reef talus', 'talus apron'). Also called scree.



**Tectonism (adjective tectonic):** deformation of the Earth's crust and the consequent structural effects (e.g. **faulting**, **folding** etc.), often associated with crustal plate movements and mountain-building.

**Tertiary:** a period of geological time ranging from about 65 to 2 million years ago, preceding the **Quaternary** Period.

**Tidal prism:** the volume of water that passes in or out of an inlet during a tidal cycle.

**Tidal range:** the difference in water height between Extreme High Water of Spring Tides and Extreme Low Water of **Spring Tides**.

**Tidal stream:** the alternating horizontal movement of water associated with the rise and fall of the tide (cf. **current**).

**Tied island:** an island connected to the mainland, or to another island, by a tombolo.

**Till:** unsorted, non-stratified **sediment** deposited directly by **glacial** ice without the intervention of water; commonly known as 'boulder clay' or 'glacial till'.

**Tombolo:** a spit that links an island to the mainland or to another island, formed by deposition when waves are refracted round the island.

**Tràigh:** (pronounced 'try') a Gaelic term for a beach, shore, or strand.

**Training:** the building of walls or embankments within an **estuary** to direct **current** flow and stabilize a shifting channel.

**Transgression:** see **marine transgression**

**Triassic:** a period of geological time ranging from about 230 to 195 million years ago.

**Tsunami:** a wave train, or series of waves, generated in a body of water by an impulsive disturbance that vertically displaces the water column, including earthquakes, **landslides**, volcanic eruptions, explosions, or the impact of cosmic bodies such as meteorites.

**Unconformity:** the surface that separates two **sedimentary** sequences of different ages; it represents a gap in the geological record when there was erosion, and/or **tectonism** and/or no deposition. There is often an angular discordance between the two sequences.

**Undercliff:** a subordinate cliff comprising material fallen from the cliff above; the lower part of a cliff whose upper part has undergone landsliding.

**Voe:** a regional term used in Shetland for an inlet, usually glacially eroded.

**Wave:** a ridge of water between two depressions. As waves approach a shore, they curl into an arc and break. The energy of surface waves is responsible for most coastal erosion.

**Wave exposure:** the degree of wave action on an open shore, governed by the distance of open water over which the wind may blow to generate waves (the **fetch**) and the strength and incidence of the winds.

**Washover fan:** a fan-shaped body of **sediment** deposited by marine waters flowing landwards through or across a coastal barrier such as a **bar** or island. Such features are formed especially during storms when the barriers are likely to be overtopped.

**Waterfall:** a steep fall of water along the course of a river or stream. River **erosion** may produce a waterfall where the river crosses a band of hard rock; the waterfall will continually retreat upstream through **erosion**. Coastal erosion may produce a waterfall where cliff retreat, proceeding faster than the downcutting river erosion, forms a **hanging** valley.

**Water layer weathering:** **weathering** processes related to the wetting and drying of sea **cliffs** and **shore platforms** by waves, spray and tides.

**Water table:** the level within a rock mass below which all voids are filled with groundwater; above it the **vadose zone** is freely draining, and below it the **phreatic zone** is totally and permanently saturated.

**Watershed:** the boundary delimiting a river drainage basin as the basic hydrological unit.

**Wave quarrying:** the prising or pulling away of pieces of rock by the shock of impact of breaking waves.

**Weathering:** the process by which rocks are broken down in place by physical, chemical and biological processes; the term does not infer any transportation of the weathered rock material (cf. **erosion**).

**Wetland:** an area of low-lying land where saturation with water is the dominant factor in determining the nature of soil development and the types of fauna and flora living in the soil and on its surface. Examples include **bogs**, **fens**, marshes and swamps.

**World Heritage Site:** a site designated under the international Convention Concerning the Protection of the World Cultural and Natural Heritage (the 'World Heritage Convention').

**Zawn:** Cornish word for a narrow gully or cleft in the rocks leading down to the sea.