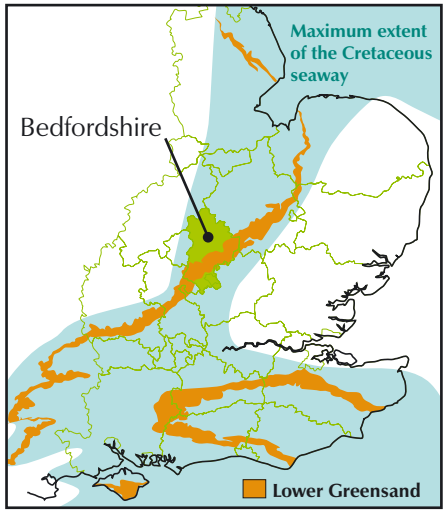
The Lower Greensand Formation

The Lower Greensand formation stretches right across southern England, showing on the surface as thin sinuous strips running from Norfolk SW to the Isle of Wight, and again south and east of London. It changes its character and its local name across the country; here in Bedfordshire it is known as the ***Woburn Sands***. In the Lower Cretaceous the sea washed these tiny grains of quartz sand south and west from Yorkshire to Bedfordshire and beyond.



What's in a name?

Today there are strict rules for the naming of rocks, which are almost always named for the best place to see them. The LOWER GREENSAND FORMATION is one of many old names too famous to change, even though it's not green and there are sandstones, clays, silts and ironstones in this sequence. It got its name when the Victorians assumed the green sandstone at the base of the Bedfordshire Chalk was the same as all other sands. When they found that these sands were separated by the Gault Clay (and many million years in time), they simply renamed the younger green sandstone the 'Upper Greensand' and the older, lowermost the 'Lower Greensand'.

The Bedfordshire & Luton Geology Group

We exist to encourage understanding of the geology and geomorphology of the county and to undertake site recording, interpretation, advice and education. We aim to:

- Protect local geological and geomorphological sites
- Encourage public enjoyment of rocks, fossils and landscape
- Encourage the use of RIGS* sites by the public, by schools and local groups
- Keep a listing of RIGS sites in Bedfordshire
- Provide information for potential users of sites
- Encourage landowners to participate in the scheme
- Involve landowners and users of RIGS in good practice and management

What are RIGS?

Regionally Important Geological and Geomorphological Sites, places that reveal our geological past and are considered important enough to deserve conservation. They include sites where rocks can be seen (such as quarries and road cuttings) or where the geology or geological processes can be inferred from the shape of the landscape. Even buildings made of local stone can be RIGS! Official RIGS are recognised by county councils and by Natural England (the statutory nature conservation body of England).

How to contact us

For more information about the BLGG and our events as well as the geology and geomorphology of your area visit our website at

www.bedsrigs.org.uk

or contact Chris Andrew c/o Bedford Museum, Castle Lane, Bedford, Bedfordshire MK40 3XD.
Tel: 01234 353323; Fax: 01234 273401

ENGLISH NATURE

Supported by English Nature through Defra's Aggregates Levy Sustainability Fund

The Lower Greensand

the basics

Bedfordshire & Luton Geology Group

bringing landscape to life

Reach Lane Quarry, Heath & Reach.

In the Lower Cretaceous, while dinosaurs walked on dry land, Bedfordshire was a sandy shallow seaway. That seaway is now the Greensand Ridge; the sands are the basis of the modern quarrying industry in the Leighton-Linslade area.

PRESENT

QUATERNARY
2.6 million years

TERTIARY

65 million years

CRETACEOUS

146 million years

JURASSIC

208 million years

TRIASSIC

245 million years

PERMIAN

290 million years

CARBON-IFEROUS

362 million years

DEVONIAN

408 million years

SILURIAN

439 million years

ORDOVICIAN

510 million years

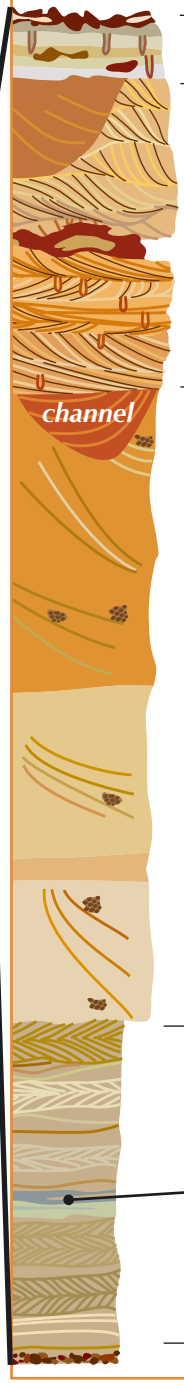
CAMBRIAN

570 million years

PRE-CAMBRIAN

4.6 billion years

The Lower Greensand in Bedfordshire:
The Woburn Sands



Ironstone

The Silty Beds appear only in the Heath & Reach area.

The Red Sands

There are almost no fossils in the Woburn Sands. Sometimes worms or other animals found a spot sheltered from the tides and currents; their burrows survive as trace fossils.

The Silver Sands may be many colours, including red-brown, sandy tan – and silver-grey!

Throughout the Woburn Sands there are signs that currents and tides moved the sands back and forth.These movements built up many thin layers of sand to form dunes on the seafloor; we see the pattern of those layers when cliffs and quarries display sections through the dunes.

All the sands are cemented together by iron oxide (rust!). Sometimes there's enough iron oxide to bind the sands into hard brown sandstone.

The Brown Sands appear across Bedfordshire, but are seen at their best in the Heath & Reach area.

Seams of Fuller's Earth (reworked ash from a volcanic eruption) are found in the middle of the Brown Sands.

Phosphate pebble bed

The Woburn Sands tell the story of a sudden rise in sea level 115 million years ago. England had been dry land for about 40 million years (from the end of the Jurassic period), and erosion by wind and water had worn away many layers of older rock. Then sea-levels rose rapidly as the result of the most significant global warming the Earth has known. In Bedfordshire we see this event as the sudden influx of marine sands into a narrow seaway running right across the county.

Leighton Buzzard is an unusual area as the Woburn Sands can be divided into three distinct types: the Brown Sands, the Silver Sands and the Red Sands. Each tells us about a different episode in the story of the flood.

The Silty Beds at the top of the formation preserve an unusual sequence of silts, sands and clays laid down in a tidal flat around the estuary. The sands mark periods when it was flooded by the sea; at other times muds and silts were left behind by river water and rain.

The Red Sands are the rarest sands, formed in high-energy floodwater channels that cut down into the other sands, gouging out several narrow paths. Today they can only be seen in the Billington area (Pratt's Pit). They are highly unusual in that they contain tiny black balls made of an iron mineral called *goethite*. Geologists have no idea how these miniature cannon balls formed – there are still mysteries to be solved in this intriguing science.

The Silver Sands were sand bars forming at the mouth of this estuary. They are full of fossil wood brought down by the river from cycad forests growing on higher ground. Fossil charcoal tells us that fires sometimes raged in the forests. The Silver Sands can be seen in many quarries including Munday's Hill and Stone Lane.

The Brown Sands are the oldest, at the bottom of the formation. They formed where a large estuary fed into the sea: you can see the evidence of the tide reversals in the sands, and fresh and brackish water algae survive as fossils to be found with a microscope! These sands can be seen best in Nine Acres Quarry, but Munday's Hill and Stone Lane Quarries are impressive.

There are good views into Stone Lane and Reach Lane Quarries from public footpaths in Heath & Reach. All quarries mentioned are privately owned and not open to the public. Entry is by arrangement only; contact the RIGS group for more information.

The Silty Beds, with fossil burrows of worms and shrimps digging into the sands and muds of the tidal flats.

The Red Sands. The pale stripes are quartz and the dark ones are goethite (an iron mineral).

The Silver Sands are pure quartz sand, sometimes white, but often lemon to pale orange in colour. Look carefully at the sand grains and you will find pink, lemon and mauve grains (rose quartz, citrine and amethyst).

The Brown Sands showing tidal bedding (oblique lines in two directions).