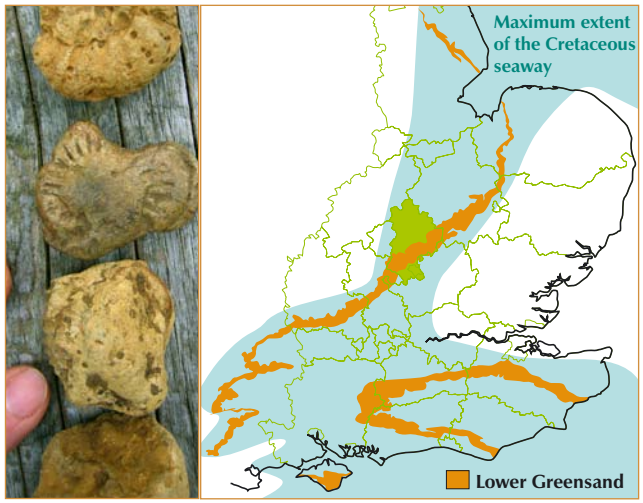
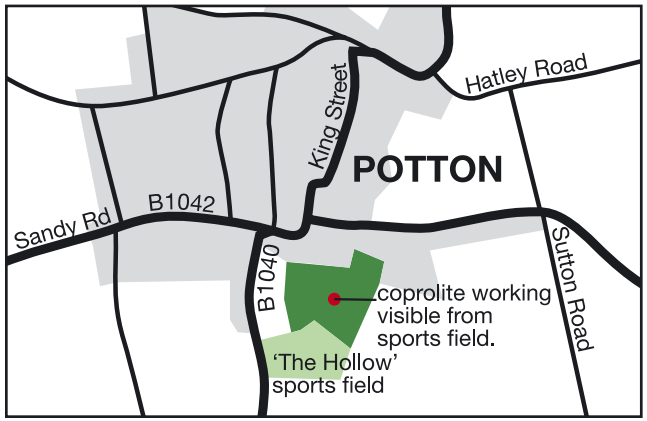
Our coprolites are not dinosaur dung!

'Coprolite' comes from the Greek words *kapros* and *lithos*, meaning 'dung' and 'stone'. Real dinosaur dung dating from the Jurassic period is found in Britain, but the coprolites of Bedfordshire, Cambridgeshire, Hertfordshire and Buckinghamshire are nodules of phosphate-rich Cretaceous sediment, often containing fragments of fossils.

Rising sea levels due to global warming in the Lower Cretaceous period created a seaway running southwest from the Wash across Bedfordshire and on toward the Isle of Wight. The currents and tides in the seaway washed ammonites and many other fossils out of the Jurassic clays and rolled them back and forth across the new seafloor. Worn, rounded fragments were transported to areas of deposition with high levels of phosphate from dead shellfish and other animals. The nutrient-rich sediments coated these *derived fossils* (so known because they're derived from other sediments) to form *concretions* while calcium phosphate slowly replaced the calcium carbonate of the fossils. Burrows of animals living in the seafloor filled with sediment: the casts are known as *trace fossils*. Both trace and derived fossils are known as coprolites when they are mined from the **Gault Clay** and what is now the **Lower Greensand** or *Woburn Sands*.



Above left: coprolites (fragments of ammonites) from the Lower Greensand at Potton with fingers for scale.



Few signs of the coprolite industry survive even in Potton, where an estimated 600 acres of land were worked. Potton History Society has a coprolite collection, some field names record the workings, and the shallow dip in a field north of 'The Hollow' is said to have been the last Bedfordshire coprolite working.

The Bedfordshire & Luton Geology Group exists to encourage understanding of the geology and geomorphology of the county and to undertake site recording, interpretation, advice and education

Regionally Important Geological and Geomorphological Sites (RIGS) are 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. Official RIGS are recognised by county councils and by Natural England.

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

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Bedfordshire's geological industries

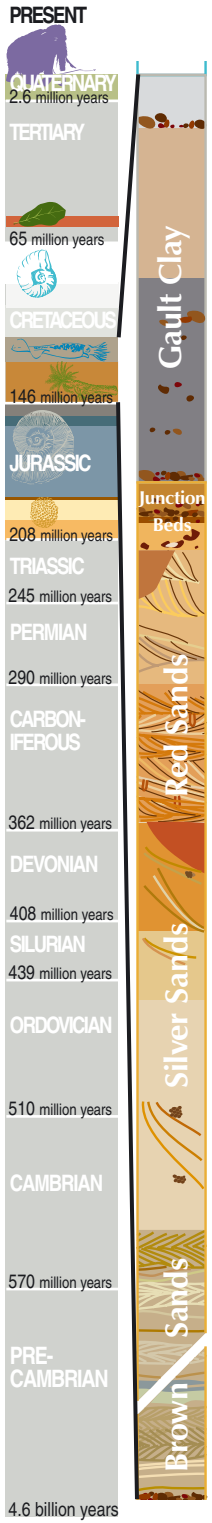
Coprolites: *fossil fertiliser*

Bedfordshire & Luton Geology Group

bringing landscape to life

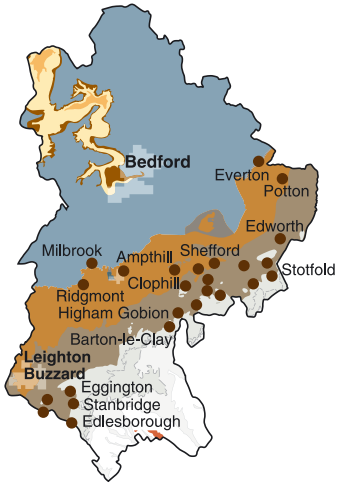
This shallow decline in a field near 'The Hollow' in Potton is said to have been the last coprolite working in Bedfordshire.

A layer of phosphatic nodules under the productive arable fields of the Gault Clay sparked the 19th century 'Coprolite Rush'.



Where were coprolites found?

Bedfordshire coprolites are found in the the **Lower Greensand** deposited in the Cretaceous seaway and the **Gault Clay** laid down in the deepening sea. These form a band across the lower third of the county. *The brown dots mark known coprolite workings.*



Coprolite deposits within these sediments mark periods or places of erosion and redeposition. A layer is found at the base of the **Upper Gault** with scattered deposits in the **Lower Gault**. The **Junction Beds** between the Gault and the Lower Greensand contain rich deposits that mark a period of erosion and re-working.

There are no coprolites in the **Red Sands** and **Silver Sands**, but there is a bed at the base of the **Brown Sands**, the earliest member of the Woburn Sands formation.

1m

The cross-section of Cretaceous deposits containing coprolites to the left has been drawn very roughly to scale, but the depth of the sediments is very variable. For example, the Brown Sands vary from 10m to 25m in thickness.

How were coprolites used?

Arable fields require fertilisers if they are to produce good crops year after year. Animal manure provides nitrogen and other nutrients, but lime (calcium carbonate) also improves the yield. In the early 19th century chemists discovered that the phosphates present in lime as impurities were as important as the calcium. Burnt and crushed bone contained both calcium and phosphate, but released the minerals slowly. In the 1830s Baron von Liebig discovered that plants could more easily use the residue of bones treated with sulphuric acid and dried. This was the first artificial fertiliser. To satisfy the demand buffalo bones from the US and mummified cats from Egypt were shipped to the UK for processing. In 1842 John Bennet Lawes patented the acid treatment, and the Rev. John Henslow found high levels of phosphate in coprolites. In 1847 Edward Packard established the first factory to produce fertiliser from coprolites at Ipswich: the 'coprolite rush' began.

This was a labour-intensive industry: the population of many parishes in Cambridgeshire and Bedfordshire soared as diggers arrived with their families, who gleaned and sorted the coprolites. Trenches were dug to the level of the deposits. When the trench floor was cleared of coprolites it was backfilled with spoil from the next trench and so the diggers worked their way across fields. It was back-breaking work and men died when the sides of trenches gave way, or blasting to clear hard-pan misfired.

The mix of soil and coprolites shovelled from the trenches was taken to a washmill in the field where a horse-powered harrow raked the fossils under running water to wash away the soil. The cleaned coprolites were then shipped as cheaply as possible to a 'manure works' for processing.

Coprolite diggers in the 19th century.

Courtesy of Buckingham County Museum.

The end of the coprolite rush

Although heavy rains in the late 1870s ruined harvests and increased costs for coprolite contractors, the introduction of the Free Trade Act probably did more damage to the industry. British farmers could not compete with the imports of grain and new, refrigerated foods from North and South America, while the coprolite industry itself was in competition with bulk rock phosphate. In 1877 the UK produced 69,000 tons of coprolite – and imported 170,000 tons of rock phosphate from just one port, Charleston in the US. By the turn of the century the coprolite rush was over. Many of the fields worked in east Bedfordshire became market gardens shipping vegetables to London and the Midlands by rail.

Not just fertiliser…

Coprolite deposits were the source of a great variety of fossils. Even worn specimens could be identified, adding to our knowledge of the animals of the Jurassic. In addition to the shells and casts of marine invertebrates, the bones of marine reptiles such as the icthyosaur, pliosaur and plesiosaur have been found. The bones of terrestrial reptiles are also found.

Dinosaur tail vertebra (left) and pliosaur tooth (right) from the coprolite bed at the base of the Gault. The triangular cross-section of the tooth indicates it came from the Jurassic Kimmeridge Clay.

Snail or gastropod *(top left), bivalve shell (top right) and ammonites (below) collected from the Potton coprolite beds. Both photos from the Bedford Museum.*