# Introduction

Cramond village is located near the mouth of the River Almond in northwest Edinburgh. The village is well known for its rich history dating back to prehistoric times. Less well known is Cramond's geological history which has shaped the landscape we see today.

The history from Roman times is well recorded. The Roman Fort built at Cramond as an outlier of the Antonine Wall (c.142 A.D.) was used as a base for the campaigns by Septimus Severus (208 A.D.) and occupied thereafter. Several sites behind the local church have been excavated, notice boards give further information about the Fort and its buildings.

Cramond Tower and the laird's mansion show four successive architectural developments that the lairds undertook, and helps to complete the picture of the increasing prosperity of the landowners from the 15th century.

Learn more by visiting the Cramond Heritage Trust's local information centre at 'The Maltings', open from April to September from 2-5pm on Saturdays and Sundays, and each day during the Edinburgh Festival. It can also be opened for schools and groups at other times by arrangement.

*Cramond Village & riverside. The red arrow shows the location of the local information centre.*

This leaflet is published by Lothian and Borders GeoConservation and the Cramond Heritage Trust. Lothian and Borders GeoConservation is a committee of the Edinburgh Geological Society and works to identify and promote sites of local interest for geodiversity. We publish a range of information leaflets, which are available from www.edinburghgeolsoc.org.

# How to get to Cramond


*Map reproduced with permission of Ordnance Survey and Ordnance Survey of Northern Ireland. Licence number 100033582*

Cramond is easily accessible from the city centre and farther afield.

**By Bus**

Lothian Bus number 41 stops just after Cramond Glebe Road, which leads down to the shore.

**By Bike**

A traffic free cycle route runs to Cramond, starting in Haymarket. The route can be found at http://innertubemap.com/

**By Car**

From the A90 take the B9085 to Cramond and parking is available behind Cramond Inn.

**Acknowledgements**

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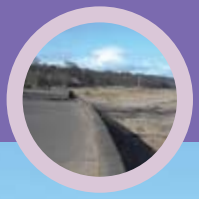


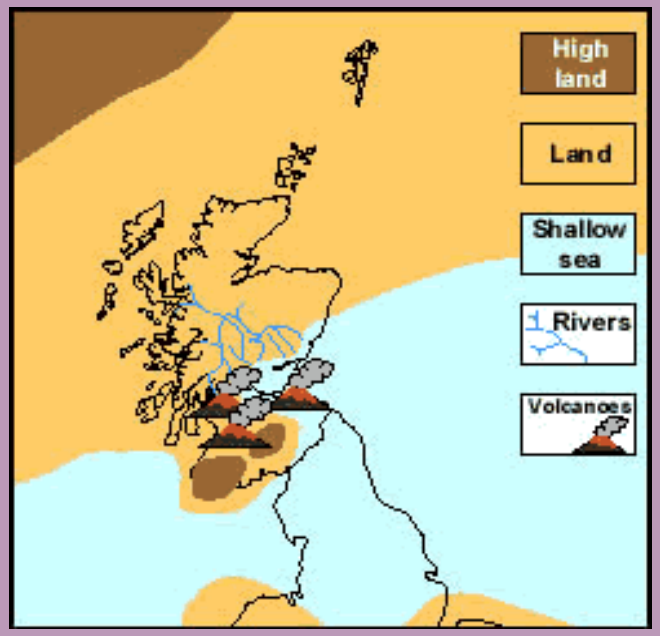
# Geological History of Cramond

## Edinburgh

Lothian and Borders GeoConservation and Cramond Heritage Trust

# The geological history of Cramond

The geology of Cramond highlights two important intervals in Scotland's geological history. During the first, about 340-350 million years ago in the Carboniferous Period, Scotland lay just south of the equator and the climate was hot and wet all the year round. The majority of Edinburgh's rocks formed then and the Arthur's Seat volcano erupted.




*Map showing how 'Scotland' may have looked during the Carboniferous. Scotland's present outline is shown to help visualise where different types of rocks were formed during the Carboniferous Period.*

*From scottishgeology.com, ©National Museums Scotland.*

At times the Edinburgh area was covered by shallow, warm lakes and sometimes seas . Sand and mud were deposited in the water and formed the sandstones and mudstones seen at Cramond. When water levels fell, the emergent land was covered with swamp vegetation. Over time this plant material was buried and compacted, forming thin coal layers.

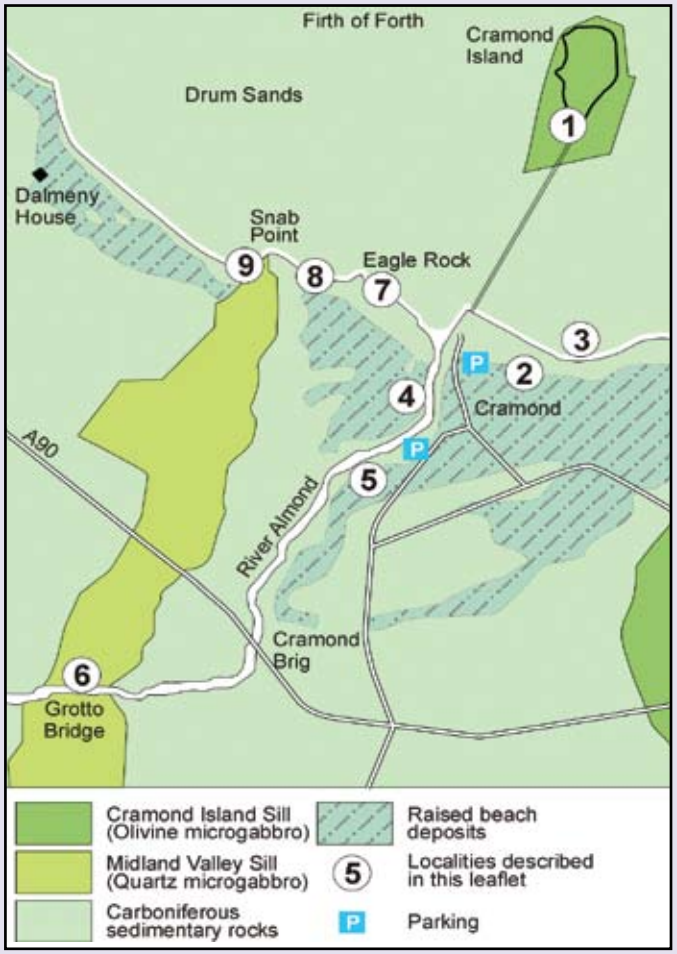
Volcanic activity was widespread in central Scotland at this time. In west Edinburgh rising magma created numerous igneous intrusions, formed when magma cools and crystallises underground.

The second important time period represented here is the last 2 million years, very recent on the geological timescale! This is the Quaternary Period, when Scotland was in approximately the same global position as today. Episodes of dramatic climate cooling caused ice ages and on several occasions ice sheets have covered this area. The most recent one reached its maximum size about 20,000 years ago, when it was over a kilometre thick, and reached as far south as Cardiff and The Wash (King's Lynn). As the ice sheets flowed across the country they eroded the bedrock and effectively formed the landscape we see today. As the last ice sheet melted and disappeared, Mesolithic people migrated north and inhabited this post-glacial landscape.

# Geological Localities

The localities are described inside this leaflet and can be visited in any order. Cramond Island is only accessible at low tide so you need to check the tide times which can be found on the notice board at the start of the causeway. Allow at least 90 minutes for a visit to the island.

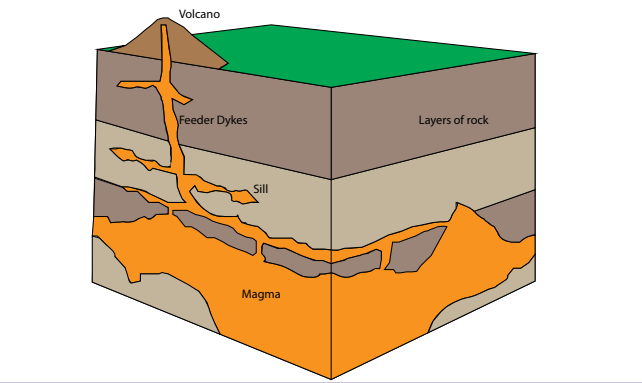
To visit the coastal localities on the west of the River Almond you will need to cross the river at Cramond Bridge.




# Cramond's Geological Localities

## Locality 1 Cramond Island

Cramond Island is tidal and can be accessed by the causeway at low tide. The whole island is made of microgabbro, formerly known as dolerite. This igneous rock is created when magma cools below ground forming an intrusion that is younger than the surrounding sedimentary rock. Cramond Island is a sill, formed by sideways intrusion that created a horizontal layer parallel to the existing sedimentary strata. Many sills formed around Edinburgh during the Carboniferous Period as the Earth's crust was being stretched, allowing magma to rise towards the surface. Another sill can be seen at localities 6 and 9. The Cramond Island sill contains large crystals, indicating that the magma cooled over a long period of time.




The sill was tilted slightly by later tectonic movements, and it now slopes to the west. This is responsible for the shape of the island today, with a long gentle slope to the west and cliffs on its eastern side. The tough rock has created a ramp for ice sheets moving eastwards, which have slid up and over the island smoothing and polishing its western slope. In contrast, the eastern slope has had blocks plucked off it by the moving ice, forming a cliff.

There was a quarry on the island during the late 18th and early 19th centuries, and the rock was quarried "for the floors of ovens, a purpose for which it is admirably suited". The 'ovenstone' quarry became flooded, and was later filled in so that it is no longer clearly visible.

From the northern side of the island you can see Inchmickery, another island formed by intrusive microgabbro. It was heavily fortified during World War II and is now a Special Protection Area due to the range of breeding sea birds.

Cramond Island is owned by Dalmeny Estates and is now uninhabited. The oldest evidence of human activity on the island is an early Christian long cist that was discovered by the army during WWII. Its position was not recorded.

The British Wool Society grazed sheep on the island in the 1790s and the land was farmed for many years until the last farmer, Peter Hogg, died in 1904. Later various buildings were used as holiday accommodation and the island became part of the River Forth defence system during both world wars. The anti-shipping barrier on the east side of the causeway was built during World War II, and there are now many ruined buildings of the same age on the island.

## Locality 2 Raised Beaches

Along the coast eastwards towards Granton you can see a good example of a raised beach, just inland from the shore.

This raised beach is of particular interest to archaeologists as artefacts dating from 10,500 years ago have been found here, suggesting prehistoric hunter-gatherers inhabited the area then. The artefacts included flakes of flint and chert thought to be stone tools, as well as burnt hazelnut shells.

The raised beach indicates the level that the sea reached about 6,500 years ago. At this time, when land and sea were rising at the about the same rate, the sea was able to cut a notch into the land surface and deposit beach sediments. Most of Scotland has been rising out of the sea for the last 15,000 years, because of isostatic uplift after the last ice age. The mass of ice on the land caused it to sink and as the ice retreated and the overlying mass was removed, the land slowly began to rise, producing raised beaches.

## Locality 3 Cramond Fish

The Cramond Fish was created by sculptor Ronald Rae and is one of a series of sculptures he has made using pink granite from the Corrennie Quarry in Aberdeenshire. Granite is coarse-grained which allows identification of its constituent minerals without needing to use a microscope. The two main minerals are dull grey quartz, and pinkish alkaline feldspar. Granite is a silica-rich igneous rock and its coarse grain size suggests it took a long time to cool beneath the Earth's surface.

## Locality 4 The River Almond– Old docks

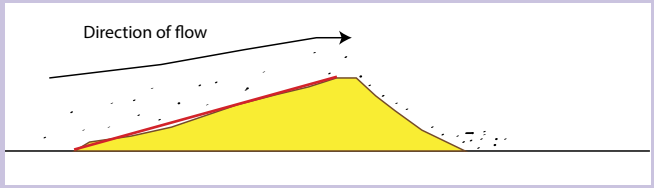
South of the Cramond Boat Club there is a footpath along the River Almond. Erosion by large quantities of ice-cold water heading to the sea as the last ice sheet melted helped to shape the present course of the river.

On the other side of the river are old docks that were part of the transport system from Craigiemill Quarry farther upstream, where Carboniferous sandstone was extracted. The docks were linked to the quarry by a tramway.

Records show that sandstone was being quarried throughout the Cramond Parish and in 1536 sandstone from here was used for building and repair work at Holyrood Palace.

## Locality 5 The River Almond- Fair-a-far Iron Mill

There are various outcrops of sandstone on both sides of the river. However, the best example is in the cliffs beside the ruins of Fair-a-far Mill. Here you can see sets of planar cross-bedding. These sedimentary structures are very useful as they indicate that this sandstone was deposited by an ancient river that flowed south from distant mountains into a delta.




The diagram shows how cross-bedding is formed, with the red line representing the beds seen in the photograph above.

Fair-a-far Mill dates back to the 18th Century and was used as a grain and waulk mill by local farmers in addition to a small colony of weavers. From 1750 the industry in the area changed and the mills became iron works.

## Locality 6 The River Almond- Grotto Gorge

From Cramond Bridge you can walk along the northern side of the river until you get to the second crossing at Grotto Bridge and the Grotto Gorge. Here you can see rocks that are very different from the sedimentary rocks seen elsewhere along the riverbanks. This is an igneous sill, the same general type of rock as Cramond Island. However, here the chemical make-up of the microgabbro is slightly different and this sill is part of the Midland Valley Sill Complex that extends from here to Stirling in various connected intrusions. The sill is tougher than the surrounding sedimentary rock and has been less affected by erosion, which is why it forms such a prominent feature. However, at the end of the ice age flowing meltwater was able to erode the sill, forming the gorge. The council further enhanced this effect in the 1930s when channels were cut through the rock as part of a flood alleviation scheme.

## Locality 7 Eagle Rock

This crag is made of Carboniferous sandstone and there is impressive cross-bedding at the base of the cliff.

Historically this rock is very important as it is thought that the eagle carved into it is Roman. Evidence for the occupation of the Romans in Cramond is abundant around the village and dates back to the early 140s AD. The Roman funerary Cramond Lion sculpture was found in the river at the former ferry crossing. They used the Almond Estuary as a harbour and built a fort overlooking it.

## Locality 8 Coal Formation

The track on the west side of the river reaches the beach close to the small cliff pictured below. These sedimentary rocks were formed in the Carboniferous period and include an upper layer of sandstone, underlain by grey mudstones and siltstones that contain bands stained with iron oxides. Beneath this is a thin coal seam.

The formation of coal was common during the Carboniferous when extensive forests covered low lying, swampy land close to the sea. Plant remains built up within the swamps forming peat, and then during deep burial (kilometres) the peat changed to coal. About 200 metres along the beach towards Snab Point you will see well-preserved fossil ripple structures on the surface of the sandstone layers. These ancient ripples are very similar to the modern ones forming on the shore today.

## Locality 9 Snab Point

Snab Point is a continuation of the microgabbro sill seen at locality 6 (see geological map). Again, the igneous rock forms a prominent feature since it is more resistant than the surrounding sedimentary rocks. Looking closely at the rock you can see it has a smooth surface due to weathering, and there are many cracks in it - these are joints, fractures formed as the rock cooled and shrank.