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## Llanddwyn Holocene RIGS Site

NRW RIGS no. 575 [SH 38772 62790]

[GeoMôn Global Geopark original webpage](#)

### RIGS Statement of Interest:

Llanddwyn Holocene RIGS Site displays the only undisputed Holocene raised beach landforms in Wales. Three major raised beaches are present on the island and take the form of low seaward-sloping platforms (dimensions). On their seaward side, the platforms descend to modern beach level via a steep, largely vegetated cliff about 1m in height. Their landward margin is marked by subdued fossil clifflines cut in rock and, locally, glacial sediments. The remains of about four other raised beaches survive, but most of these landforms appear to have been eroded by modern wave attack. All the raised beaches occur within tight embayments, bordered on the seaward side by small rocky headlands. The modern beach deposits that directly border the best-developed elevated Holocene platforms are largely vegetated with marram grass and sea holly, suggesting that the cliff between the modern and fossil beaches is not currently undergoing significant marine erosion. The platforms appear to be underlain by sand and shingle, although there is no analytical work to prove this.

**Geological setting/context:** About 2.4 million years ago there was a general cooling of the Earth's climate, heralding the onset of the Quaternary "Ice Age", a period of geological time extending to the present day. In reality, the period has seen a number of cold 'glacial' periods interspersed with warmer 'interglacial' periods such as the one in which we now live. Since about 450,000 years ago there have been at least four intensely cold periods during which large parts of upland Britain were covered by ice sheets for long periods. Although Anglesey was probably overrun by ice on these occasions, only evidence from the last major glacial phase – the Late Devensian – is known. Possible evidence from the warm interglacial period before the Late Devensian may locally have escaped the destructive erosional and depositional effects of the last ice sheet. Following gradual climatic warming, the Late Devensian ice sheet had probably disappeared from Anglesey by about 14,500 years ago. From this time, vegetation began to spread back over the land surface and soils started to form. The speed of plant colonisation and soil development was affected by fluctuations in climate. An intensely cold period about 11,000–10,000 years ago, known as the Younger Dryas, saw the reappearance of small cirque glaciers in the uplands of Snowdonia and elsewhere in Britain. Stratigraphic evidence for this cold period is known from several basinal peat sequences on the island and it is likely that there was discontinuous permafrost, local frost-cracking of the ground surface and the redistribution downslope of unconsolidated sediment such as boulder clay. The Younger Dryas was followed at about 10,000 years BP by what is known as the Holocene – the current interglacial. In Anglesey, as in the rest of Wales, the Holocene saw the development of temperate deciduous mixed oak forest and its progressive modification by humans. Early plant colonisers, such as crowberry, juniper, birch and willow were succeeded by ash and hazel and later by oak, elm and pine. Wetter periods, aided by the early tree-felling activities of humans, saw the extensive development of lowland bogs and extensive heaths. In inland areas of the island, soil development and plant colonisation reduced geomorphological activity. Locally, however, the solution of limestone continued and limestone pavements were exhumed. Significant changes, however, occurred around the coast. Throughout Devensian late-glacial time and into the Holocene, the Earth's crust recovered and rebounded from its depression beneath an extensive ice cover. Around the coastline of Wales, the Holocene rise in sea level culminated about 6,000 years ago. Rates of relative land/sea-level change due to the interplay between ice retreat (during deglaciation), rising global sea level and crustal recovery or 'rebound', were subject to wide variation. Deglaciation of Welsh coastlands occurred earlier than in Scotland, for example, and crustal rebound occurred before rising global sea levels were able to modify the coastline. An exception is the slightly raised Holocene beaches of Anglesey which occur only a few metres higher than present sea level. The intermittent occurrence of 'submerged forest' beds seen in foreshore exposures around the coast of Anglesey (and widely elsewhere around the Welsh coast) attests to the inundation of a densely wooded coastal fringe by the rising Holocene sea. Four sub-networks of RIGS have been selected to demonstrate the most important aspects of the Holocene evolution of Anglesey. These are: 1. Holocene peat beds and pollen biostratigraphy; 2. Holocene sea-level changes; 3. limestone pavements; and 4. Man and the Holocene.

**Network context of the site:** Llanddona belongs to Network 1 ('Holocene sea-level changes'). It is one of a series of sites that provides evidence for the Holocene sea-level history of the island. Whereas Gallow's Deep RIGS provides the most detailed Holocene sea-level record yet known from the region, Llanddwyn Island provides the best examples of the slightly raised Holocene beaches which occur on the island and a good example of the periodically exposed submerged forest bed. Malltraeth Marsh and Llanlleiana provide important complementary records of sea-level change and terrestrial sedimentation, while Cemlyn Bay provides a superlative example of a Late Devensian drumlin landscape drowned and modified by the Holocene sea. Llanddona provides a controversial and unique example of a proposed Holocene raised beach conglomerate that provides a rare insight into the evolution of Anglesey's coastline during the Holocene.

## References:

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## Section B

### Practical considerations

**Accessibility:** The site is reached via the A 4080 Newborough to Aberffraw road, turning west in Newborough to the large public car park in Newborough Forest (SH 405634). There is currently a £2 toll to enter the forest. The car park, operated by Forest Enterprise, has toilet and picnic facilities and there is usually ample room for parking cars and mini-buses, and coaches may use the facility by special arrangement [check]. There is direct pedestrian access from the car park onto Newborough beach, but a 1.5km walk westwards to the island is required. The island is reached via a sandy causeway and is sometimes completely cut off at high tide. The island is part of a National Nature Reserve cared for by CCW. Some parts of the island are periodically 'out of bounds' due to the presence of nesting and breeding birds.

**Safety:** The Holocene raised beaches are gently cliffed on their seaward side but pose no unusual safety problems. The features are easily approached from inland routes even at high tide, when much of the Llanddwyn coast is otherwise inaccessible. The submerged forest beds are located in the intertidal area between the island, Porth y Cwch, Gwddw Llanddwyn and Ro Bach. They are only rarely exposed following intensive winter storms and periods of severe coastal scouring. When exposed, the marine clays and peat beds are slippery but pose no unusual safety problems. The normal safety precautions for working in coastal areas should be observed and the state of the tides should be monitored.

**Conservation status:** This RIGS lies within the much larger Newborough Warren GCR site, within Newborough Warren – Ynys Llanddwyn NNR and SSSI (notified for their geological, biological and geomorphological features), within Y Twyni o Abermenai i Aberffraw pSAC and within Anglesey AONB. The RIGS lies adjacent to Newborough Forest RIGS selected

for its Precambrian pillow lavas and associated features. The remains of St Dwynwen's Church (Scheduled Ancient Monument No. AN046) lie close by.

## **Ownership/planning control**

**Planning Authority: Isle of Anglesey County Council. Planning status/constraints and opportunities:** There are no known plans to develop or modify the area covered by this RIGS. The area covered by the RIGS has multiple conservation designations which should facilitate optimum conservation (and potential enhancement) of the features of interest.

## **Condition, use & management:**

**Present use:** The RIGS lies within a GCR site, SAC, SSSI, NNR and AONB in what is one of Wales' premier conservation areas. The area's principal use is for conservation and public recreation. CCW uses goats and ponies for selective grazing of the island's vegetation. The much-visited remains of St Dwynwen's Church lie in the central part of the island.

**Site condition:** The Holocene raised beach features are in good overall condition and virtually unmodified. The submerged forest and peat beds lie in the intertidal zone and are not currently exposed. Their condition when last exposed was satisfactory, with peat beds, tree stumps and other wood debris clearly visible. Potential threats: The main threat to the raised beach deposits would be the excavation and removal of the sand and shingle deposits that make up the features. In view of the island's multiple conservation designations such activity is unlikely, and the identification of these landforms and deposits in this report is specifically aimed at minimising the chances of inadvertent damage. Excavations or engineering works in the intertidal zone could severely damage the submerged forest bed.

**Site Management:** A close liaison should be maintained with the landowner(s) and local planning authority over all aspects of site management. The current status of the features is ideal and no modifications are currently required.

## **Site development**

**Potential use (general public):** Llanddwyn Island is generally accessible and receives a considerable number of visitors. However, the Holocene beach features lie in remoter and currently less disturbed parts of the island. These areas might not be able to sustain significantly more visitors. This, coupled with the rather specialist scientific nature of the features, probably rules out the production of feature-specific materials for the general public (leaflets and boards). However, there is scope for including the raised beach features in a range of more general interpretative materials describing the geology, wildlife and archaeology of the island. Because the submerged forest beds are rarely exposed, there seems to be little advantage in including these in any interpretative materials.

**Potential use (educational):** Because the submerged forest beds are rarely exposed, this part of the site is not suitable for educational use. However, the locality has significant research potential. The Holocene raised beaches, however, are superbly developed and reasonably accessible (but see **Accessibility**; above) and could be used to demonstrate key geomorphological concepts at school and university levels. It would be possible to incorporate the geomorphological features into an educational booklet describing the world-class Precambrian geology of the island.

**Site geometry:** Site boundary