**CYNGOR CEFN GWLAD CYMRU**
**COUNTRYSIDE COUNCIL FOR WALES**

SITE OF SPECIAL SCIENTIFIC INTEREST CITATION

**CONWY** **MWYNGLODDIAU A CHREIGIAU GWYDYR**

**Date of Notification:** 2002

**National Grid Reference:** SH 780612

**O.S. Maps:** 1:50,000 Sheet number: 115
1:10,000 Sheet number: SH75 NE
SH85 NW
SH86 SW
SH76 SE

**Site Area:** 139.4 ha

**Description:**

This site consists of a large number of isolated areas of disused mine workings and spoil heaps within the Gwydyr Forest near to Betws-y-Coed. The different sections of the site are located at around 200 to 300 m and many are closely surrounded by coniferous plantations. The different parts of the site are of special interest for their geological features, plant assemblages and their use by bat colonies as hibernation sites.

The site includes two important geological conservation review sites, namely the outstanding exposures of Ordovician igneous rocks at Sarnau and the internationally important mineral deposits at Cae Coch Mine.

Sarnau (Ordovician Igneous):

Sarnau provides the best available exposures through the Ordovician Middle and Upper Crafnant Volcanic formations, which consist of the eruptive products from the youngest of three major volcanic centres which were active during the 2nd Eruptive Cycle in northern Snowdonia during Caradoc times. In contrast to the other major volcanic centres in Snowdonia, the Crafnant Centre is completely buried by younger rocks and its eruptive history and palaeoenvironmental setting can only be inferred from its outflow products.

The outcrops at Sarnau are comparable in age to the Longvillian Snowdon Volcanic Group but differ from that group in facies association. The Middle Crafnant Volcanic Formation is characterized by an ordered sequence of acidic ash-flow tuffs integrated with flaggy, evenly bedded, remobilized tuffaceous to volcaniclastic sedimentary rocks which were derived from a volcanic centre tentatively located farther to the north and east. The Upper Crafnant Volcanic Formation comprises a massive heterogeneous unit of unsorted tuffaceous sedimentary rocks which is separated from the underlying Middle Crafnant Volcanic Formation by blue-black cleaved mudstones. The emplacement of these volcanogenic deposits into dark marine mudstones and siltstones suggests either deposition from high-density turbid flows or a deep-

water submarine eruption through unlithified muds. Sarnau is a key site for studies of volcanic and volcaniclastic lithologies, sedimentary structures and eruptive and depositional environments.

Cae Coch Mine (Mineralogy of Wales):

The massive stratabound pyrite deposit at Cae Coch Mine is of national metallogenic interest but is also of international importance for the microbial ecosystem developed within the underground workings. The origin of the Cae Coch stratiform pyrite deposit is controversial, the most recent models invoking either contemporary volcanic exhaltative mineralization or a syndiagenetic inhalative replacement process involving the large-scale bacterial reduction of sulphate to sulphide in the presence of an iron-rich flux leached from underlying volcanic rocks. Extensive post-mining oxidation of the pyrite has produced copious quantities of iron sulphate minerals dominated by fibroferrite, and accompanied by melanterite and copiapite. The oxidation is largely bacteriogenic with acidophile autotrophic and heterotrophic bacteria forming in excess of $100m^3$ of gelatinous streamer-growths which result in acidic, iron-rich mine drainage.

Biological Interest:

The areas included are of special interest for the distinctive plant assemblages which occur on rocks and spoil which are contaminated by heavy metals and also for the bats which roost in the mine systems during the winter. The habitat formed on the mine spoil is considered to be a form of 'Calaminarian Grassland' habitat found on such sites in different parts of Europe. Various specialist metallophytic species are associated with abandoned heavy-metal mines such as those found in the Gwydyr Forest. As well as particular species (especially lichens and bryophytes), these include specially adapted variants of more widespread taxa. Extensive mining in the Gwydyr area took place in the 19th and 20th centuries, although there is evidence of mining before this time. Commercial mining took place from the late 1800s through to the middle of the Twentieth Century, when the majority of the ores had been removed and mining had become unviable. The principal ore mined in the Gwydyr region was sphalerite (zinc sulphide), although some galena (lead sulphide) was also removed. The methods of extraction employed at the mines have left the legacy of large amounts of waste spoil throughout the area. This spoil now forms an important habitat within the forest. Afforestation with conifers first took place at Gwydyr in 1921 around the time that many of the mines were closing, but much of the contaminated spoil remains free from tree cover allowing colonisation by specialist species.

In particular, the lower plants (lichens and bryophytes) are of interest at the sites. Notable species present include the nationally rare moss *Ditrichum plumbicola,* and a nationally scarce liverwort *Cephaloziella stellulifera*. Nationally scarce ferns at the sites include, forked spleenwort *Asplenium septentrionale*, and lanceolate spleenwort *A. obovatum*. *Gyalidea subscutellaris, Vezdaea acicularis, V. rheocarpa*, and *Coppinsia minutissima* are all nationally scarce lichens found at these mine sites. Flowering plants found at some sites include the nationally scarce alpine penny-cress *Thlaspi caerulescens*, and the locally uncommon sea campion Silene maritima.

The abandoned mines are of importance for several species of bat as roosting sites, particularly when hibernating. Several of the mine systems in the forest support colonies of lesser horseshoe bat *Rhinolphus hipposideros,* which are considered to be rare in Europe. Other bat species which are found in the mine systems are Daubenton's bat *Myotis daubentonii*, whiskered bat *M.*

*mystacinus*, brown long-eared bat *Plecotus auritus*, pipistrelle bats *Pipistrellus sp.*, and Natterer's bat *M. nattereri*.

**Remarks:**

These sites support vegetation assignable to Calaminarian Grassland. This habitat type is listed on Annex I of the EC Habitats Directive (Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora & Fauna). The lesser horseshoe bat is listed on Annex IIa of the Habitats Directive. Parts of this site form the Mwyngloddiau a Safleoedd Ystlumod Gwydyr / Gwydyr Mines and Bats Sites candidate Special Area of Conservation.

Mwyngloddiau a Chreigiau Gwydyr SSSI is located within the Snowdonia National Park.

Lesser horseshoe bat and pipistrelle bats are UK Biodiversity Action Plan species.

*D. plumbicola*, lesser horseshoe bat, Natterer's bat and pipistrelle bats are Snowdonia Local Biodiversity Action Plan species.

Mines and mine wastes is a Snowdonia Local Biodiversity Action Plan Habitat.