

TROWBARROW LOCAL NATURE RESERVE

MANAGEMENT PLAN

2007 - 2017



**Arnsdale and Silverdale Area of Outstanding Natural Beauty Unit
on behalf of Lancaster City Council and Trowbarrow LNR Advisory Group**

Following on from the initial Trowbarrow LNR Management Plans 1997-2001 and 2002-2007 by Jane Harvey BSc (Hons) Dip TP (Site Warden), this is an updated progress report and future proposals prepared by Roger N. Cartwright - Landscape and Woodlands and Tony Riden BSc Countryside Officer Arnside and Silverdale AONB March 2007



The John Mabson Gate on the permissive footpath access through the Trough.

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INTRODUCTION

Trowbarrow quarry (disused) and associated woodland (see Maps 1, 2 and 3) was acquired on 23 December 1996 by Arnside/Silverdale Landscape Trust (after a public appeal to raise funds) and was given immediately to Lancaster City Council to manage as a Local Nature Reserve (LNR).

The site is in the centre of the Arnside/Silverdale AONB (see Map 1) and immediately to the east of the Carnforth-Barrow railway line. This location led to it being developed as a quarry and lime works in 1857 by Northern Quarries Ltd., initially producing lime but diversifying by the end of the 19th century to produce tarmacadam which was marketed as “Quarrite ... the new dustless paving”. It is believed to be the first site where tarmacadam was produced by the same “hot stone” method as is still used today. Blackpool Motor Track (Promenade) was constructed from Trowbarrow tarmacadam in 1904-5.

The quarry and works were subsequently acquired by Tarmac Ltd., which ceased quarrying in 1959. Tarmacadam was produced for a few more years using stone from the nearby quarries at Middlebarrow and Sandside. Limestone dust was marketed for a couple of years before operations finally ceased. The crushing plant and hoppers adjacent to the railway were demolished in the early 1970s and all remaining derelict buildings were removed in 1992.

Man’s intervention by quarrying the hillside has exposed the dramatic geological formation of Trowbarrow and led to its designation as a Site of Special Scientific Interest (SSSI). The stages and pattern of land use have led to different stages of colonisation and succession in woodland compartments plus the quarry floor (see Map 3), each with its individual character and flora and fauna, some of which are nationally scarce. Species lists are available from the AONB Office in Arnside.

For these reasons the site, has been designated a Local Nature Reserve (LNR) and is being managed sympathetically to maximise its conservation and its aesthetic, historical and geological potential as a resource for the public to enjoy both for recreation and education.



Juniper shrubs and limestone grassland conservation

1. SITE DESCRIPTION

1.1 General Information

1.1.1 Location

Parishes: Silverdale and Yealand Redmayne

Local Planning Authority: Lancaster City Council

Grid Reference: SD 481 758 sheet 37/47

Maps: O.S. 1:50000 sheet 97
1:25000 Outdoor Leisure 7
1:10000 SD 47 NE

Access: Public footpaths from Moss Lane and across Silverdale Golf Course; two permissive footpaths from Storrs Lane.

1.1.2 Area: 12.5 hectares (30.89 acres); SSSI coverage 7.03 hectares (17.37 acres).

1.1.3 Tenure: Acquired by Lancaster City Council in December 1996.

1.1.4 Status: Site of Special Scientific Interest (SSSI) notification in 1990 under Section 28 of the Wildlife and Countryside Act 1981 (copies of notification documents are held in the AONB Office)
Limestone Pavement Order (LPO) notification in 1991 under Section 34 (1&2) of the Wildlife and Countryside Act 1981 (copies of notification documents are held in the AONB Office)
Noted in the Geological Conservation Review
Lancashire County Biological Heritage Site
Local Nature Reserve (LNR) declared in 1997 (copies of notification documents are held in the AONB Office)

1.1.5 Legal Responsibilities

Due to the SSSI status, English Nature must be notified and consent granted for any works that need to be carried out. This is because of the geological importance of the site.

Activity on the LPO designated areas must be agreed by Lancashire County Council prior to work commencing.

1.1.6 Management

Trowbarrow is to be managed by a Management Advisory Group consisting of Lancaster City Council, Silverdale Parish Council, Yealand Redmayne Parish Council, English Nature, the British Mountaineering Council (BMC), the Royal Society for the Protection of Birds (RSPB), Lancashire Wildlife Trust (LWT) and the Arnside/Silverdale AONB Landscape Trust and AONB Unit staff representative in attendance. This group will consider management proposals to be undertaken on the site and instruct/advise the AONB Unit on a work programme.

1.2 Environmental Information

1.2.1 Physical Information

Trowbarrow is a wooded limestone ridge running north-south and rising to a height of 67m (220 feet) above Ordnance Datum (O.D.) at its highest point. On the west side of the hill a disused quarry, with a weathered face of exposed near vertical bedding planes up to 50m (160 feet) high, forms a dramatic feature in the landscape of the AONB. An unusual gorge 5-10m (16-32 feet) wide runs along the western boundary of the quarry floor (refer to Map 3). Known as the Trough or “trow”, it is from this feature, plus the Saxon word “barrow” for hill, that Trowbarrow derives its name.

The site is of great importance geologically, primarily because of the vertical bedding of the Lower Carboniferous Urswick Limestone. The following features confer geological importance:

- (a) At various locations within the site, limestone bedding-planes of different ages are exposed. Some of these contain numerous trace fossils and also colonial corals, while others show evidence of palaeokarst surfaces, in addition to other sedimentary lithologies such as shales and mudstones. The site is thus an outstanding locality for the study of faunas and sedimentary environments enduring the Lower Carboniferous Limestone (Asbia-Brigantian stage). Hence its designation as a geological SSSI.
- (b) Within Trough Plantation North West and Storrs Lane Wood there are small areas of exposed limestone pavement. These are unusual in that, instead of being composed of clints and grikes in horizontal bedding planes, the grikes are formed from acid solution erosion of the vertical bedding planes.
- (c) The Trough is an interesting feature, formed where a broad softer bedding plane of shale between two beds of vertical limestone has been eroded preferentially to form a natural valley in which fossil algae are exposed on the walls.

1.2.2 Biological Information

The vegetation in and around the quarry varies considerably in age and content. For description purposes the site has been divided into five areas. These are:

- (i) Quarry floor and face
- (ii) Storrs Lane Wood
- (iii) Trough Plantation North West
- (iv) Lime Works Wood
- (v) Trough Plantation East

Please refer to Map 3.

- (i) **Quarry floor and face** (3.9 hectares) includes the quarry floor, cliffs and colonised spoil heaps. The quarry floor is composed of compacted limestone and dusts and is being colonised by lower growing plants including Scarlet Pimpernel (*Anagallis arvensis*), Bird’s-foot Trefoil (*Lotus corniculatus*), Salad Burnet (*Sanguisorba minor*), Fairyflax (*Linum catharticum*), Eyebright (*Euphrasia sp.*), Autumn Felwort (*Gentianella amarella*), Rockrose (*Helianthemum nummularium*) and Common Centaury (*Centaureum erythraea*). When wet, the substrate has a marl-like clay quality and water is retained in a number of places on the quarry floor, where Soft-rush (*Juncas effusus*), Hard-rush (*Juncus inflexus*), Greater Reedmace (*Typha latifolia*), Branched Burr-reed (*Sparganium erectum*) and Glaucous Sedge (*Carex flacca*) occur. On the better drained mounds to the south there are Dark Red Helleborine (*Epipactis atrorubens*), Twayblade (*Listera ovata*), Common Spotted Orchid (*Dactylorhiza fuchsii*) and Fly Orchid (*Orphrys insectifera*). There are also pockets of Bracken (*Pteridium aquilinum*) and Gorse (*Ulex europaeus*). Wood False-brome (*Brachypodium sylvaticum*), *Festuca sp.* and Blue Moor Grass (*Sesleria albicans*) are abundant in various quantities around the margins of the quarry floor, where there is also primary Birch (*Betula pendula*) and Willow (*Salix sp.*) growth. A fine Crab Apple (*Malus*

sylvestris) is located against the fossil wall toward the southern end. Ash seedlings are proliferate and thereby continue the process of succession.

- (ii) **Storrs Lane Wood** (1.8 hectares) has a mix of Oak (*Qercus sp.*) and Ash (*Fraxinus excelsior*), with Yew (*Taxus baccata*), Wych Elm (*Ulmus glabra*), Birch and Sycamore (*Acer pseudoplatanus*) thinly spread through the wood. This is good quality secondary ancient semi-natural woodland that may have been managed as a coppice with standards until the turn of the century. The shrub layer consists of Hawthorn (*Crataegus monogyna*), Hazel (*Corylus avellana*) and holly (*Ilex aquifolia*), with Bramble (*Rubus fruticosus*) and Ivy (*Hedera helix*) being dominant in the heavily shaded ground flora. Honeysuckle (*Lonicera periclymenum*), Wood False-brome, Barren Strawberry (*Potentilla sterilis*), *Viola sp.*, Wood Melick (*Melica uniflora*), Broad Buckler Fern (*Dryopteris dilatata*), Male Fern (*Dryopteris filix-mas*), wood Sage (*Teucrium scorodonia*) and Glaucous Sedge are also apparent in the ground flora. Bird's Nest Orchid (*Neottia nidus-avis*) has been found occasionally.
- (iii) **Trough Plantation North West** (1.5 hectares) consists mainly of Yew with Oak, Ash, Sycamore, Wych Elm, Birch and occasional Scots Pine (*Pinus sylvestris*) and is a good quality semi-natural woodland. The understorey consists of Hazel, Holly, Juniper (*Juniperus communis*) and Purging Buckthorn (*Phyllitis scolopendrium*), together with Dog's Mercury (*Mercurialis perennis*), Wood False-brome, Wall Lettuce (*Mycelis muralis*), Herb Robert (*Geranium robertianum*), Ivy, Wild Strawberry (*Fragaria vesca*), Polypody Fern (*Polypodium sp.*), bramble and mosses.
- (iv) **Lime Works Wood** (4.0 hectares) is situated on the west of the site between the main-line railway and the quarry floor.
 - (a) At the western edge, adjacent to the railway and Myers Dyke, Hemp-agrimony (*Eupatorium cannabinum*) is established while pioneer plants on the rubble piles include Marjoram (*Origanum vulgare*), Golden-rod (*Solidago virgaurea*), calcareous grasses and brambles. These are being encroached upon by Birch and Goat Willow (*Salix caprea*).
 - (b) East of the entrance track and car parks, an open, self-sown Birch and Goat Willow wood has developed with a few Ash, Oak and Sycamore. Notable here are the two suppressed Juniper bushes, the prolific number of Twayblade throughout, and Broad-leaved Helleborine (*Epipactis helleborine*).
 - (c) East of the public footpath, the main part of Lime Works Wood is dominated by oak standards with a coppiced Hazel and Hawthorn understorey, plus Birch, Ash, Sycamore and Wych Elm. A number of specimens of Purging Buckthorn have been suppressed but now management work has created clearings around these.
 - (d) On the periphery of the wood and the quarry floor, an open area contains Wood False-brome, Dog Rose (*Rosa canina*), Knapweed (*Centaurea nigra*), Red Clover (*Trifolium pratense*), Ribwort Plantain (*Plantago lanceolata*), Glaucous Sedge and two Juniper bushes. Common Reed (*Phragmites australis*) is also apparent where it is damp. Birch are encroaching.
- (v) **Trough Plantation East** (3.1 hectares) is situated on the steep east facing slope and covered with a predominantly Sycamore plantation. There are a number of dead Elm (*Ulmus sp.*) and the occasional Sweet Chestnut (*Castanea sativa*) and Horse Chestnut (*Aesculus hippocastanum*). The woodland appears to be a neglected coppice last managed some 30-50 years ago. The ground flora consists of Dog's Mercury, Bramble, English Bluebell (*Hyacinthoides non-scriptus*), Wood Anemone (*Anemone nemorosa*), Primrose (*Primula vulgaris*) and Male Fern. Black Bryony (*Tamus communis*), mosses and liverworts can also be found in the ground flora of the sycamore plantation.

1.2.3 Fauna

The various types of woodland habitat found on the site means that it is suitable for a wide range of animals, birds and insects. Roe Deer (*Capreolus capreolus*) are resident and Red Deer (*Cervus elaphus*) visit the area and lie in the woodlands. Brown Hare (*Lepus capensis*), Rabbit (*Oryctolagus cuniculus*) and Grey Squirrel (*Sciurus carolinensis*) are apparent with Fox (*Vulpes vulpes*), Badger (*Meles meles*), Stoat (*Mustela erminea*), Weasel (*Mustela nivalis*), Hedgehog (*Erinaceus europaeus*) and bats including Noctules and Pipistrelle, using the site, but information on numbers and distribution is presently limited.

Viviparous Lizard, Common Toad (*Bufo bufo*) and Slowworms (*Anguis fragilis*) inhabit the spoil mounds. The piles of rocks and the mounds of compacted lime dust are both unusual habitats within the Arnside/Silverdale AONB. The former are important for insects and spiders (including house spiders), while the latter are inhabited by mining bees and wasps. Butterflies in the woodland include Comma (*Polygonia c-album*), Speckled Wood (*Pararge aegeria*) and Brimstone (*Gonepteryx rhamni*), whilst the quarry floor and open areas have Peacock (*Inachis io*), Dingy Skipper (*Erynnis tages*), Large Skipper (*Ochlodes venata*), Northern Brown Argus (*Aricia artaxerxes*), Red Admiral (*Vannessa atalanta*), Small Tortoiseshell (*Aglais urticae*) and whites, with Pearl-bordered Fritillary (*Boloria euphrosyne*) and High Brown Fritillary (*Argynnis adippe*) being noted occasionally.

Dragonflies, particularly Common Darter (*Sympetrum striolatum*), are common on the quarry floor and damper areas. Four different species of grasshopper have been recorded.

Birds are present both in the woodland areas and in the quarry. A breeding colony of Jackdaw (*Corvus monedula*) nests on the quarry face. Kestrel (*Falco tinnunculus*) may be seen both in and around the quarry and also the woodland. Tawny owl (*Strix aluco*) breed in the woodland and Little Owl (*Athene noctua*) frequent adjoining fields. Sparrowhawk (*Accipiter nisus*) hunt along the woodland edges and Buzzard (*Buteo buteo*) may be seen overhead. Pied Wagtail (*Motacilla alba*) and Green Woodpecker (*Picus viridis*) feed on insects on the quarry floor. Pheasant (*Phasianus colchicus*) also feed on insects and berries in the quarry and woodland. Shelduck (*Tadorna tadorna*) breed in rabbit burrows. Blue Tit (*Parus caeruleus*), Great Tit (*Parus major*), Long-tailed Tit (*Aegithalos caudatus*) and coal tit (*Parus ater*) frequent the birch scrub in the quarry as well as breeding in the woodland. In the spring and summer months, these are joined by Willow Warbler (*Phylloscopus trochilus*) and Chiff-chaff (*Phylloscopus collybita*). The woodland is home to other familiar woodland species, many of which breed and winter here and include Chaffinch (*Fringilla coelebs*), Greenfinch (*Carduelis chloris*), Robin (*Erithacus rubecula*), Dunnock (*Prunella modularis*), Goldcrest (*Regulus regulus*), Blackbird (*Turdus merula*), Song Thrush (*Turdus philomelos*), Mistle Thrush (*Turdus viscivorus*), Redwing (*Turdus iliacus*) and Fieldfare (*Turdus pilaris*) in winter, Nuthatch (*Sitta europea*), Greater Spotted Woodpecker (*Dendrocopos major*), Green Woodpecker (*Picus viridis*), Woodcock (*Scolopax rusticola*), Tree Creeper (*Certhia familiaris*), Magpie (*Pica pica*), Carrion Crow (*Corvus corone*), Blackcap (*Sylvia atricapilla*) and Lesser Redpoll (*Carduelis flammea*).



1.2.4 Cultural Information

Prior to the 18th Century, Trowbarrow and the surrounding area was common land. The Trough was the demarcation boundary for Yealand Redmayne and Silverdale. Evidence from the Enclosure Award maps and the appearance of much of the woodland indicate that Trowbarrow Hill was never completely cleared of primeval woodland cover.

The eastern side of the Trough, in Yealand Redmayne, was divided into four allotments during 1778. The western side, in Silverdale, remained open pasture land until the Common and Waste Ground Act of 1817 led to Moss Dale being enclosed.

The 1st Edition Ordnance Survey Map of 1845 shows the ridge of Trowbarrow covered in woodland. The western side of the quarry now known as Lime Works Wood, is divided into several fields and shows no woodland cover, which suggests that it was used for grazing pasture. When the land was purchased by Northern Quarries Limited, the grazing of this land ceased and scrub encroachment occurred, developing into a secondary woodland.

Whilst the quarry was in operation, many of the woodland areas received little formal management intervention. Since the quarry closed during the 1960s, areas of limestone pavement and loose rock were removed for rockeries and other domestic landscape features, in particular from the southern edge. The deserted site, with its range of habitats and interesting succession of plants, was soon discovered by amateur naturalists, who came to study the botany and birdlife in particular.

Rock climbers first ventured onto the site in the late 1960s. Although the site was no longer worked, a blast was carried out in 1970, which opened up a number of cracks, including the famous Jean Jeanie and thereby made the site more appealing to climbers. Now there are more than 110 recognised routes on the quarry faces.

Extensive recreational use of the quarry floor by off-road motorcycles caused severe damage to the quarry floor and led to a loss of ground cover, and also created erosion tracks through Storrs Lane Wood. The banning of motorcycles once the site was acquired has been effective, and colonisation by pioneer species continues. Some disturbance is however; desirable for species like dark red helleborine and solitary bees and wasps, so informal recreational mountain biking is permitted.



The location where the geological fold can be seen.

2. EVALUATION AND OBJECTIVES

2.1 Evaluation of Features

2.1.1 Size

Of the 12.5 hectares (30.89 acres) that make up the reserve, 7.03 hectares (17.37 acres) are of SSSI status, with the LPO covering a similar area. It is predominantly a relatively small lowland woodland with a range of successional stages, including grassland and scrub on the quarry floor.

2.1.2 Diversity

Limestone cliffs, scars, pavement, scarified quarry floor, boulders, calcareous grassland, scrub and various woodland successional stages associated with limestone habitats, are present. The soils are lime-rich, deriving from limestone bedrock (and some previously imported limestone quarry waste dust from Sandside Quarry during latter years of Tarmac activities). The topsoil that is found on the site is called *rendzina*, a black humus-rich soil that is dark in colour with just a small amount of soluble lime. There are a few acidic habitats, especially in the north of the site in Trough Plantation North West, possibly caused by pockets of loess. Lime-rich soil with a clay content derived from the quarry workings covers the quarry bottom and forms mounds in the south of the quarry floor. Rain run-off catchment pools have been created; a small spring and irregular water-course flows in the upper part of Lime Works Wood after rainfall; and Myers Dyke forms the western boundary for a short distance (flowing between Hawes Water SSSI to Leighton Moss RSPB reserve, to which it is the main feeder stream).

2.1.3 Naturalness

The limestone pavement areas and the woodland in Trough Plantation North West and Storrs Lane Wood are the nearest representations of natural vegetation on the site. The natural colonisation on the southern end of the quarry floor by calcareous-type grassland has developed over recent decades.

2.1.4 Rarity

The limestone pavement is a nationally rare habitat, additionally important here due to the unusual vertical bedding planes. The exposed fossiliferous bedding planes within the quarry provide an ideal place for the study of later Dinantian (*Asbian-Brigantian*) faunas and sedimentary environments. On the cliff to the south of the quarry entrance the change from horizontal to vertical bedding plane can be seen clearly. It is because of these geological features that Trowbarrow was given SSSI status. The site plays host to a number of locally rare plant species and fungi, five of which are listed in “A Provisional Red Data List of British Fungi”. The quarry bottom and surrounding woodland contain a colony of Fly Orchid (*Ophrys insectifera*). There are significant quantities of other orchids including Twayblade, Common Spotted, Dark Red Helleborine, Broad-leaved Helleborine and occasional Bird’s Nest Orchid. The unusual mounds of compacted lime dust on the quarry floor are an important habitat for mining bees and wasps.

2.1.5 Fragility

Limestone habitats are robust in terms of visitor pressure. However, in the past few years the former quarry floor was used by off-road motorcycles. This resulted in bare ground devoid of vegetation, which was constantly being disturbed, thereby reducing the possibility of natural regeneration. Secure perimeter fencing and frequent warden patrols have now excluded motorcycles. The limestone pavements and small areas of calcareous grassland are under threat from scrub encroachment, with the quarry floor also encroached upon by early colonisers such as bramble and birch.

2.1.6 Typicalness

Trowbarrow supports a fair representation of species typical of a north-west England lowland limestone site.

2.1.7 Ecological Position

Although Trowbarrow is one of the smallest woodland ridges within the Arnside/Silverdale AONB its central location between the nationally important reserves of Leighton Moss (RSPB) and Gait Barrows National Nature Reserve (English Nature) means that it provides a corridor between them, thus facilitating the spread of species and increasing the biodiversity of all three sites.

2.1.8 Potential

Its accessibility, size and diversity enable a wide range of uses to be brought together without conflict. Small educational groups can study geology, natural history (especially succession) or industrial archaeology. Rock climbers have identified many routes up the faces, whilst the main quarry floor, Storrs Lane Wood and Lime Works Wood are suitable for quiet recreational use by families and naturalists.

2.1.9 Intrinsic Appeal

Within the general landscape of the area, the overall shape of the hill is unusual because of its geological formation as a monocline and the cliff faces are attractive.

Within the site, the various successional stages of the woodland and occasional relics of the former quarry, such as the linear wagon-way through Lime Works Wood and foundations of old buildings, provide interest and surprise. The former quarry itself is dominated by dramatic cliffs with gravity-defying bedding planes and textured with trace fossils, yet it is a very sheltered, quiet and relaxing place to visit and gradually the botanical interest of the floor is increasing.

2.1.10 Public access and recreation

A public footpath enters the site from Red Bridge in the west and once the site was acquired a permissive path was constructed to allow access in from Storrs Lane in the south. A second permissive path was constructed in 2000 from Storrs Lane through the Trough, entering the site via the John Mabson Memorial Gate (a sculptural structure shaped like a climber's karabiner). In addition to the main driveway through Lime Works Wood, there is potential to make a further permissive path along the old wagon-way. The robust nature and diversity of compartments within Trowbarrow make it an ideal place to integrate quiet recreation with nature conservation. For health and safety considerations, areas like the cliffs and Trough Plantation are not suitable for public access other than by rock climbers and this is one of the reasons why a Warden is required for the site.



Native English Bluebell and Wild Primrose are present in Trowbarrow woodlands.

2.2 Main Factors Influencing Management of the Site

2.2.1 Natural Trends

Quarry Floor

Colonisation and succession are occurring rapidly on the quarry floor and this is the area which will change most. There is already some scrub and birch invasion around the margins. The bare areas within the quarry floor, particularly on the small mounds of limestone dust, need to be kept open, as they are important niches. The grassland areas within the quarry are better examples of limestone grassland, but they are also being encroached upon by scrub and birch. Gorse stands in this area are of poor quality but are still an important feature for wildlife. There is a small area of bracken to the south of the quarry floor, which is likely to spread unless checked.

Limestone Pavement

Colonisation of many pavement areas has already occurred. In most places, established mosses and ferns grow out of the grikes. This invasive colonisation is assisted by the increase in shade created by greater numbers of sycamore and other trees, which is a threat to the habitat as it will ultimately result in closed cover.

Woodland

Lime Works Wood is the most recently colonised of all the woodland compartments in Trowbarrow and within it are a number of important species under threat of being shaded out. In a few places, juniper, an open grassland shrub, is being shaded and suppressed by dense stands of birch. Clearance of these trees around the junipers has increased light penetration to benefit this important and uncommon shrub. There are small areas of grassland where the overhead power cables pass and also at the eastern periphery. These are being encroached upon by the surrounding woodland and, if left, will develop into the same sort of secondary woodland that covers the majority of Lime Works Wood. Along the southern edge, adjacent to the golf course, a number of buckthorn are apparent. These are poor specimens as a result of excess shading and competition from the surrounding trees, which have therefore been recently cleared to benefit the buckthorn.

In the area of the old tar pit and on piles of spoil near the old wagon-way, signs of Japanese knotweed (*Fallopia japonica*) were apparent when the site was first acquired by Lancaster City Council.

2.2.2 Man-made Trends

Rock climbers are likely to cause damage to the cliffs, particularly the fossils on Main Wall, and especially if they abseil, rope down or lower off. The increasing use of the site by mountain bikes needs to be monitored to ensure that the degree of disturbance to the ground flora is not excessive. The provision of an oval disabled route on the quarry floor has encouraged visitors to follow this path rather than wander and is assisting the regeneration of the flora on the rest of the quarry floor by reducing pedestrian pressure there. Now that the site is open to the public as a LNR, the dangerous nature of the environment has necessitated the provision of safety fencing. Most of this is discreetly hidden in the woods behind the cliff faces, with hazard signs displayed to indicate the proximity of the cliff edge; only one fence is constructed on the quarry floor, and this is relatively unobtrusive. The provision of car parking has been restricted to a small car park for the disabled at the periphery of the quarry floor and two small car parks on the west of the site near Myers Dyke, which are for use by educational groups and site workers. Neither site had any ecological importance. Parking for the public is available off-site on Storrs Lane.

2.2.3 Obligations

(a) Environmental

Wildlife and Countryside Act 1981.

There is an obligation to apply for consent to carry out any of the ‘Operations Likely to Damage the Special Interest’. There are also restrictions pursuant to the SSSI notification and Limestone Pavement Order (LPO).

(b) Safety

To comply with the Occupier’s Liability Act and the Mines and Quarries Act, Lancaster City Council must ensure that every reasonable care is taken to remove any risks to visitors.

- To make sure that all footpaths, stiles and any other constructions are safe
- To remove any hazardous objects
- To conduct a safety audit in order to identify any further hazards

In addition, the Health and Safety at Work Act, 1974 requires that all operations on the site must be undertaken by trained personnel, using methods and equipment approved by the Health and Safety Executive.

(c) Public Rights of Way

There are two Public Rights Of Way through the woods. In addition there are three permissive access paths; one vehicular and emergency access route; and climbers access paths.

(d) Non-legal obligations

There is an obvious and essential requirement to establish and maintain good relationships with the neighbours and any individuals interested in the site.

(e) Wardening

Wardening is essential to meet the obligations outlined above and in particular for the following Health and Safety reasons:

- to check safety fences which protect the public from hazardous areas;
- to ensure entrance gateways are in order;
- to ensure that footpaths are in good repair;
- to check for dangerous or dead trees;
- to monitor correct use of the site by climbers, cyclists and the public and advise if inappropriate use is made of the site;
- to remove litter from the site;
- to notify the AONB Unit of requirements of site management works as they arise;
- to check for other hazards within the site;
- to report back to the AONB Unit on any and/or all of these matters as appropriate.

3.0 MANAGEMENT OBJECTIVES

Long Term Vision

Is to maintain and enhance the visual interest and beauty of the woodlands, as part of the scenic setting of the quarry cliffs, as a key landscape feature in the Area of Outstanding Natural Beauty.

To protect and enhance the wildlife, scientific value and historic interest, whilst interpreting making the area accessible for the benefit of local residents and visitors.

The objectives of the previous site management plans have been retained with little change and these are summarised below:

Objective 1

To protect the rock faces and important fossils by monitoring the recreational use by rock climbers, by preventing large, commercial/educational groups from climbing and by forbidding the collection of fossils or rock samples.

Objective 2

To maintain and enhance the species diversity of the quarry floor by monitoring succession and preventing scrub encroachment and, if necessary, by harrowing the floor and disturbing the ground to create patches of bare ground in order to benefit the rare flora and fauna.

Objective 3

To create new habitats/habitat niches where possible, e.g. the creation of pond hollows and wet areas beneficial not only as a wildlife habitat and resource but also as rain run-off flood control, thereby stemming erosion of paths and access tracks.

Objective 4

To maintain and enhance the structural diversity of the woodland on the site.

Objective 5

To monitor rare species, including butterflies and orchids, throughout the site and to monitor their habitat change and to encourage and undertake research into ways of improving these habitats.

Objective 6

To prevent colonisation by invasive non-native flora.

Objective 7

To protect the areas of limestone pavement.

Objective 8

To permit only quiet recreation on the site such as climbing, walking and natural history, and to resolve potential conflict by close monitoring, especially use by mountain bikes.

Objective 9

To educate and inform the public and other user groups as to the geological, ecological and industrial archaeology value of the site and the need for management to maintain it.

Objective 10

To maintain the existing path system; to carry out regular (annual) checks of tree safety; and inform the public of dangerous or sensitive areas.

Objective 11

To maintain the safety fences and warning notices by regular inspections to ensure the safe use of the site by visitors.

Objective 12

To maintain good relations with organisations concerned with the management of the site.



Scrub and tree regeneration would soon dominate the quarry floor without intervention cutting.



Scrub control cutting and removal, grassland mow and rake to conserve and enhance calcareous grassland.



Maintenance of safety fencing.



Quiet recreational cycling on quarry floor.

4.0 SUMMARY OF PROGRESS AND MANAGEMENT PROPOSALS 2007-2017

4.1.1 Quarry Floor and Face, Compartment 4 (3.9 hectares) (Objectives 2,3,4,5)

The herb layer found on the quarry floor has continued to develop (monitored by fixed-point photography and transect surveys). Many of the herbs on the site benefit from disturbance e.g. felwort, orchids and scarlet pimpernel and this has been achieved by public use, including occasional mountain bike use. Rabbits have assisted by burrowing and scarifying the fine rock dust of the old quarry waste tips, including the lime-rich dust mounds at the southern end. The open ground and the sward area have been maintained. Selective thinning, coppicing and scrub clearance has been undertaken as planned.

This has all benefited limestone grassland flowers, butterflies and species such as the dark red helleborine and mining bees and wasps. The main climbing wall is a nesting area for a sizeable colony of about 100 Jackdaw. Kestrel and Tawny Owl have also nested in recent years on the cliffs and Peregrine Falcon have occasionally been seen flying through the site.

The small ponds and scrapes have been extended and improved. This is helping newts, frogs and dragonflies in addition to helping control rain run-off floodwater. The swampy area at the head of the wagon-way (east) has been dug out to create a holding area to reduce run-off along the wagon-way.

Proposals

To continue the programme of light thinning, coppicing and strimming to maintain open glades. Grazing is carried out at present by deer and wild rabbits. The population should continue to be monitored. Consider future grazing possibly by native ponies/sheep. Regular wardening and litter clearance is essential and will be continued.

Quarry Floor

Year	Area	Operation	Timing of Operation	AONB Unit person-days
2007, 2012	F	Lightly thin silver birch and sycamore, thin woodland edges, strim grassland.	November to February.	3
	J,H	Selective thinning and scallops. Continue to maintain ponds by digging out swamp as and when they silt-up and re-vegetate.		2
	Whole site	5-year fixed-point photography monitoring.	July 2007.	1
			July 2012 July 2017	1 1
2008, 2013	F,J,H	As year 1.	November.	5
		Monitor sward regeneration	July	
2009, 2014	F,J	As year 1.	November to February.	3
	G	Reduce scrub encroachment.		2
	H	Manage encroaching scrub and selective thinning		1
2010, 2015	F	As year 1.	November.	5
	G,H,J	Review management proposals and plan.		1
2011, 2016	F,J,H	As year 1.	November.	4
	Whole site	Monitor sward regeneration and review all management works.	July.	

Definition of 'AONB Unit person-days' means a trained member of staff, full time or contract, with a group of volunteers. Transport to and from site and use of tools including power tools is included.

To maintain vehicular access for maintenance vehicles, education groups and disabled visitors, via the gateway on Moss Lane, trees and scrub on the eastern slope of the entrance has been regularly cut back. Scalloped woodland edges have been cut along the access track.

The two grassland glades near the overhead power lines have been maintained, extended and enhanced by scalloping the edges to prevent scrub invasion and allow more light to the flora.

Oak standards and pole-sized Birch regeneration have been regularly thinned to favour the better specimens, especially of Oak and Ash, and to allow light to less common natural shrubs such as Purging Buckthorn and Juniper.

Small cages (Gen Guards) have been used in cleared areas to protect from deer browsing to encourage natural regeneration of trees, to improve age structure and species mix.

The former wagon-way has been cleared to the south by creating a linear ride 2-3m wide. This has allowed more light to the woodland floor to benefit flora, butterflies and fauna. The Hazel at the top (eastern) end of the wagon-way has been coppiced to maintain access and views of the cliff face and faulted rocks.

Proposals

The first priority is to check the deer fence around the Coppice for Butterflies enclosure, restore the entrance gate and ensure that no deer remain inside.

Year	Area	Operation	Timing of Operation	AONB Unit Person-days
2007, 2012	A	Repair coppice enclosure Reduce encroaching scrub around glades by 1-2m	July 2007 January – February	1 3
	C	Maintain the ride (2-3m wide) along the old wagon-way	November – February	½
	D	Thin woodland	November – February	2
	E	Cut back along access	November – February	1
2008, 2013		Maintain coppice enclosure and all as year 1		7½
2009, 2014		All as year 2		7½
2010, 2015		All as year 2		7½
2011, 2016		All as year 2		7½



Coppice coupe in Lime Works Wood.



Birch thinning.



Wagon-way scrub cutting.

The public footpath has been kept open and a new stile and access steps built. There has been little woodland management intervention apart from light thinning to remove Sycamore and favour the best Oak and Ash standards.

Proposals

The Warden should continue to monitor the woodland trees for safety, felling and pruning as necessary.

The Warden should monitor site use, advise visitors when appropriate and clear litter as necessary.

A second Woodland Improvement Grant should be considered to improve diversity, allow more light into the woodland and develop a better age structure. The benefit of using cages around trees is not apparent in this wood so re-use cages already bought

Year	Area	Operation	Timing of Operation	AONB unit person -days
2007, 2012	All Storrs Lane Wood	Light thinning	January	2
2009, 2013	All Storrs Lane Wood	Light thinning	January	2
2011, 2016	All Storrs Lane Wood	Light thinning	January	2



Selective light tree thinning in Storrs Wood.

Thinning and felling of 8 small regeneration coupes (up to about 0.25 ha) around existing advance regeneration of ash in the understorey has been completed. Holly, Yew, Wild cherry, Crab Apple and other native trees and shrubs have been favoured and are responding well to the increased light. There has been a noticeable increase in the richness and diversity of the ground flora, spring flowers such as: Dog's Mercury, Wild Arum, Primrose, Wood Anemone and Bluebells are all more abundant.

Most of the sycamore plantation consists of multi-stemmed coppice stools, approximately fifty years old. There are, however, some sycamore standards and a good proportion of these have been retained to increase biodiversity. It is worth noting that in November 2001 many sycamores had clusters of 16-spot cream and brown ladybirds sheltering on the trunks.

The unwanted timber and brash has been stacked to increase the amount of dead wood on site and these habitat piles are now covered in moss with a wealth of fungi. In addition, standing dead wood has been left and is providing useful habitat and adding to the diversity.

Proposals

A Woodland Improvement Grant application will be considered to help with the future costs of uneconomic thinning restoring a mixed ash wood, coppicing the area of thick overgrown Hazel at the east end, adjoining compartment 5 to further improve diversity. This will include erecting small deer fenced enclosures to assist all aspects of woodland regeneration. Provision of nest boxes for owls, small birds, bats and Dormouse will be included.

Year	Area	Operation	Timing of Operation	AONB Unit Person-days
2007, 2012	All Trough Plantation East	Continue selective coppicing of sycamore	October – February	6
2008, 2013	All Trough Plantation East	Selective coppicing of sycamore as year 1	October – February	6
2009, 2014		As year 1 - plus WIG work as described above		6
2010, 2015		As year 1		6
2011, 2016		As year 1		6



Sycamore domination in Trough Plantation East in 2005 and nest-box provision.

The Warden and volunteers have inspect the area on a regular basis, to remove litter, repair gaps in the boundary wall and fences and monitor wildlife. This area has remained a quiet haven for wildlife and benefited from minimum intervention and limited access.

Recently the walls and boundaries fences have deteriorated and sheep can get through gaps but up to now this has not caused a serious problem and may have been of benefit, (see proposals for compartment 4!)

It is understood that this boundary fence is the responsibility of the adjoining owner.

Proposals

Meet adjoining owner to discuss maintenance of boundary wall and fences combined with discussion on possible permissive access along the remainder of the Trough to the North.

Year	Area	Operation	Timing of Operation	AONB Unit Person-days
2007		Meeting with adjoining owner to discuss boundary maintenance and access	April to October	2
2008	K	Light thinning	January	2
2010	K	Light thinning	January	2



Trough Plantation East as seen from Storrs Lane, with Trough Plantation North West toward the right.

4.2 Visitor Recreation, Education and Interpretation

4.2.1 Recreation

(Objectives 1, 2, 7, 8, 9, 10, 11, 12)

As the site is within an AONB, quiet recreational pursuits such as walking, picnicking, studying natural history, birdwatching, rock climbing and mountain biking on the quarry floor are acceptable. However, the latter two need to be monitored to ensure that over-excessive use does not conflict with nature conservation. For this reason, and to ensure health and safety objectives are met, no commercial or educational groups are allowed to climb.

4.2.2 Climbing and mountain biking

(Objectives 1, 2, 5, 7, 8, 9, 10, 11, 12)

Permissive use of the quarry for climbing by individuals and small recreational groups is acceptable although top-roping, abseiling and lowering-off the Main Wall are discouraged because of its geological importance. Signs at the entrance to the site, and the cliff-top safety fencing and warning signs, emphasise that it is the individual's decision to proceed further into the site.

Mountain biking will be monitored but not discouraged initially as disturbance to the quarry floor is beneficial for flora and mining bees and wasps.

4.2.3 Notice Boards

(Objectives 8, 9, 10, 11, 12)

Signs at the entrance points to the quarry floor indicate the hazardous nature of the site and put the onus on the individual to determine whether to enter. Three interpretation boards, located within the main part of the quarry, detail the quarry's history and the geological and historical importance and natural history of the site. Another board near the Moss Lane entrance relates to the early production of lime in a Hoffmann Kiln and the importance of the site as the first place in the world to produce tarmac by the hot stone method. Disabled access to the site is by permit only from Moss Lane terminating in a car park at the west of the quarry floor.

4.2.4 Industrial Archaeology

(Objectives 9,10)

Only a few relics of the quarrying infrastructure are left. These comprise a small powder store on the quarry floor, the large shelter stone, and the wagon-way route down to the former lime works and tarmac production site.

In addition, two other features pre-date the industrial use of the site and even the arrival of the railway. These are the small bridge over the stream to the west of the site, which would have allowed movement of stock from adjacent fields before quarrying and lime production began. There is also evidence of a former gateway with stone gate stoops adjacent to the present railway in what would have been the former field boundary.

4.2.5 Education

(Objectives 1, 5, 8, 9, 10, 12)

The geological importance of the site by virtue of its fossils and vertical bedding planes is of great educational value, particularly as some of the faces showing fossils and palaeokarst are very accessible. The various botanical compartments within the site are excellent for the study of colonisation and succession and there is great potential for studying ecology, industrial archaeology and the integration of recreation and conservation.

A black and white information booklet for teachers was produced in 1997 (somewhat out-dated now) is available from the Arnside/Silverdale AONB office at Arnside.

4.3 Estate Services - Proposals

4.3.1 Maintenance of footpaths

(Objective 10)

Public and permissive footpaths and the disabled access through Lime Works Wood should continue to be maintained and kept free of obstruction to ensure safe passage. In addition, access to the main climbing routes on Main Wall, Assagai and Coral Sea should continue to be improved and kept free of obstacles. The entrance to the small fossil face should be maintained to enable wheelchair access.

4.3.2 Maintenance of boundaries

(Objectives 8, 10, 11, 12)

Repair and maintain walls and fences. Ensure trees growing adjacent to boundary walls are managed to reduce chances of wall damage. Continue measures to prevent horse and motorcycle access on to the site.

4.3.3 Wardening

(Objectives 1, 2, 5, 7, 8, 9, 10, 11, 12)

Ensure a regular patrol of the site, especially during the summer and holiday periods. Carry out monitoring of users, visitors and ecological monitoring by photographs, transects and quadrats. Ensure the general maintenance of the site, and carry out educational guided walks and field work.



Wind-blown tree across Lime Works Wood access trackway.

Income

Year	Quarry Floor	Lime Works Wood	Storrs Lane Wood	Trough Plantation East	Trough Plantation North West	Persn days	Total Cost/year
1	5	4.5	5	6		20.5	£1,538
2	4	4.5	4	6	2	20.5	£1,538
3	4	4.5	4	6		18.5	£1,388
4	2	4.5	2	6	2	16.5	£1,238
5	4	4.5	4	6		18.5	£1,388
Persn-days	19	22.5	19	30	4		
Total Costs	1425	1687.5	1425	2250	300		
Year	Wardening						
1	£2,912						
2	£2,912						
3	£2,912						
4	£2,912						
5	£2,912						



Clearing wind-blown tree from Public Footpath.



Path along the old wagon-way in Lime Works Wood.



Relocating Gen-guards.



Seasonal scrub cutting from grassland areas.

5.0 COSTS

An estimate of costs for implementing this management plan is given below.

Total cost for next 5 years' management at Trowbarrow

Year	Management Costs	Wardening	Total Costs
2007	25.5 x £100	£2,912	£5,462
2008	18.5 x £100	£2,912	£4,762
2009	21.5 x £100	£2,912	£5,062
2010	21.5 x £100	£2,912	£5,062
2011	21.5 x £100	£2,912	£5,062
2012 to 2016	Review estimated costs in light of inflation.		

The initial cost of purchase of the site and safety provision was met by funding from a public appeal, and a grant from English Partnerships. The Countryside Commission gave a grant towards production of a leaflet, interpretation boards and educational information. Application is to be made for an English Woodland Grant Scheme to assist with some of the management costs.

APPENDICES Details of these Appendices can be seen or obtained from the Arnside and Silverdale AONB Unit office at Arnside, telephone 01524 761034.

Appendix 1 – Site of Special Scientific Interest (SSSI) Notification for Trowbarrow Operations Likely to Damage the Features of Special Interest

Appendix 2 – Limestone Pavement Order (LPO) for Trowbarrow

Appendix 3 – Trowbarrow Local Nature Reserve declaration

Appendix 4 – Trowbarrow Quarry (Geology)

Appendix 5 – Plants of Trowbarrow and surrounding Woodlands

Appendix 6 – Fungi in Trowbarrow and surrounding Woodland

Appendix 7 - Invertebrates

Appendix 8 – Birds of Trowbarrow

Appendix 9 – The David Bowie connection

Appendix 10 - Occupiers Liability

Appendix 11 – Draft Constitution for Trowbarrow LNR Management Advisory Group

Appendix 12 – By-laws prepared by Lancaster City Council



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