

The Quarry Life Award: research and dialogue to promote biodiversity conservation

by HeidelbergCement AG, Germany

Quarries and gravel pits offer last refuges for rare animal and plant species within intensively-used landscapes worldwide. Numerous scientific studies clearly demonstrate that gravel pits, quarries and other mining sites have a very high value for nature conservation. Besides their importance as habitats for rare species, the cross-linking function of mineral extraction sites is of great value.

HeidelbergCement has identified this potential to create quarries and gravel pits as species-rich habitats. Moreover, the group's comprehensive biodiversity management scheme has enabled quarrying to take place even in areas of high biodiversity value and has significantly increased the probability of a positive outcome of permitting procedures. HeidelbergCement was the first company of its sector to develop and implement a "Guideline for biodiversity management in quarries and gravel pits" in Europe. In Asia and Australia, the guideline was adapted to regional requirements and introduced as a handbook. The core of the guideline are its three strategic pillars:

1. Protecting nature and the environment

This includes the protection of soil and subsoil, avoidance of contamination of ground or surface water and priority to local plant species.

2. Increasing biodiversity

This covers the promotion of biodiversity even in active quarries and site-specific restoration plans. Also the consideration of ecological and economic value of the after-use land and the natural development of certain areas within quarries.

3. Encouraging dialogue

This pillar promotes dialogue with all stakeholders and the involvement of third parties regarding after-use planning (environmental authorities, conservation organisations, local communities).

A team of six in-house ecologists takes care of the implementation of the policy. Global key performance indicators, training of employees as well as partnerships with NGOs all help to put the strategy into practice. Moreover, the Quarry Life Award is another tool to promote HeidelbergCement's biodiversity principles.

The Quarry Life Award – discovering biodiversity

The Quarry Life Award (QLA) is a biannual international scientific and educational

contest where HeidelbergCement invites researchers, students and graduates to carry out research projects in its quarries. HeidelbergCement initiated the award to gain new insights into the promotion of species diversity in quarries both during and after extraction. Moreover, the competition aims at improving the quality and the awareness of rehabilitation campaigns on the ground. The first award contest took place in 2012 and the second was recently concluded in 2014. Ninety-five research projects, selected by expert juries from over 390 proposals handed in by applicants have been implemented in 22 countries on five continents. Each project focussed on one of the four categories of the QLA:

1. Discover biodiversity in mining sites – Increasing knowledge about biodiversity in mineral extraction sites.

2. Biodiversity and rehabilitation – Promoting biodiversity in quarry rehabilitation (nature protection, forestry, agriculture, recreation etc.)

3. Biodiversity and education – Social and educational activities focussing on mining and biodiversity (nature trails, cooperation with schools, NGOs etc.)

4. Biodiversity management during extraction – Optimising the biodiversity value of the quarry during the extraction period.

With an average of five persons per project, almost 500 people took part in the contest. The countries/regions involved were Australia, Benelux, Bosnia and Herzegovina, Czech Republic, Germany, Georgia, Ghana, Indonesia, Kazakhstan, North America, northern Europe, Poland, Romania, Russia, Spain, Tanzania, Turkey, UK and Ukraine.

The winners of national contests were announced at the end of November 2014, whilst the international winners of the 2014 QLA were presented at the award ceremony in Prague on 10 December. The Grand Prize was awarded to the project entitled "A comprehensive inventory of herpetofauna at the Górażdże limestone quarry", led by Edyta Turniak of the NATRIX Herpetological Association, Poland. A comprehensive inventory of the reptiles and amphibians indicated that its high degree of biodiversity is due mainly to the presence of many amphibian and reptile species. As a consequence, a list of recommended land reclamation practices was developed.

Figure 1: silt reed restoration in progress



Location:	Wykeham quarry in Yorkshire, England and comparative sites in the UK and The Netherlands
Size:	~150ha
Mineral type:	Gravel and sand
Habitat(s) created:	Silt and mud banks, water fringe vegetation, freshwater lakes
Target species:	Northern Lapwing, Redshank, other waders
Protected areas:	None in immediate area
Organisations:	Hanson UK, University of Hull Centre for Environmental and Marine Sciences, Scarborough Campus, RSPB and BirdLife International

Meanwhile, the winning projects of the previous QLA round are still ongoing and have been proven to create valuable knowledge about quarry rehabilitation and contribute to wider conservation goals.

Restoring quarry silt lagoons for migrant waders – project part I

One of the winning projects of the QLA 2012 addressed the ‘Restoration of quarry silt lagoons for wader conservation at Wykeham’ by researchers from the University of Hull, led by Philip Wheeler (see Table 1). This project, implemented in the UK and supported by Hanson UK, investigated the constellation of wading bird species in the Wykeham pits and how the composition of sand deposits affects species diversity.

Wading birds have declined in numbers across Europe as the intensification of lowland agriculture has caused severe habitat destruction and degradation. Aggregate extraction sites present areas of exposed fine sediments deposited as waste material in silt lagoons which could recreate lost wader habitats. This project explored the value of silt lagoons for wading birds by investigating sediment composition, invertebrate food availability and monitoring bird activity at Wykeham quarry.

Project objectives

The aim of the project was to investigate birds of different ages living on silt lagoons and assess which species are present and how use varies across sites throughout the year with a particular focus on waders.

It also hoped to characterise the physicochemical properties of sediments sampled from a variety of locations from restoration sites of different ages and extract invertebrates from sediments to assess their diversity and abundance. It was then able to provide recommendations for management of silt lagoons.

Research methods

The research involved studying bird activity around past and active settlement ponds on a weekly or fortnightly basis. Sediment samples were collected from the three sites at Wykeham.

Where possible, the different microhabitats were sampled to investigate the effects of

vegetation and sediment type on freshwater invertebrate abundance and richness. Sediment analysis was also carried out.

Project results

After six months of research (March–September 2012), the team reported 21 bird species on the active settlement area. The number of species and the number of individuals using the area showed a seasonal pattern with usage dropping from April to May, remaining low through May, June and July and increasing markedly in August and September. The only waders seen feeding at this site were those with short bills, which feed on surface or near-surface invertebrates.

The research showed that sediments in active settlement areas have very low invertebrate diversity and abundance, even though nutrient availability, water chemistry and organic

content are all commensurate with sediments that support abundant and diverse invertebrates. Particle size distributions show clear differences between the sites. There is a prevalence of very fine sand and silts in the active settlement area, where tightly compacted, finely-laminated deposits were apparent.

Conclusion

This research showed that settlement ponds can, and do, provide habitats for wading birds at certain times of the year. The suggestion is that the very fine, uniform sediments of modern silt lagoons result in the formation of an impenetrable layer of sediment, which results in anoxic conditions at shallow depths in the depositing sediment. This prevents the growth of invertebrates and reduces the sediments’ ability to provide feeding grounds. Introducing some larger, more variable sediment to the surface of active deposition areas may improve oxygen diffusion and enhance the value of these sites for wader conservation.

Restoring quarry silt lagoons for migrant waders – project part II

After receiving the second prize in the international QLA in 2012, the project leader, Phil Wheeler, decided to move on with the project. Based on the expertise in the ecology of wading birds, freshwater invertebrates and

Figure 2: potential pathways for wader birds

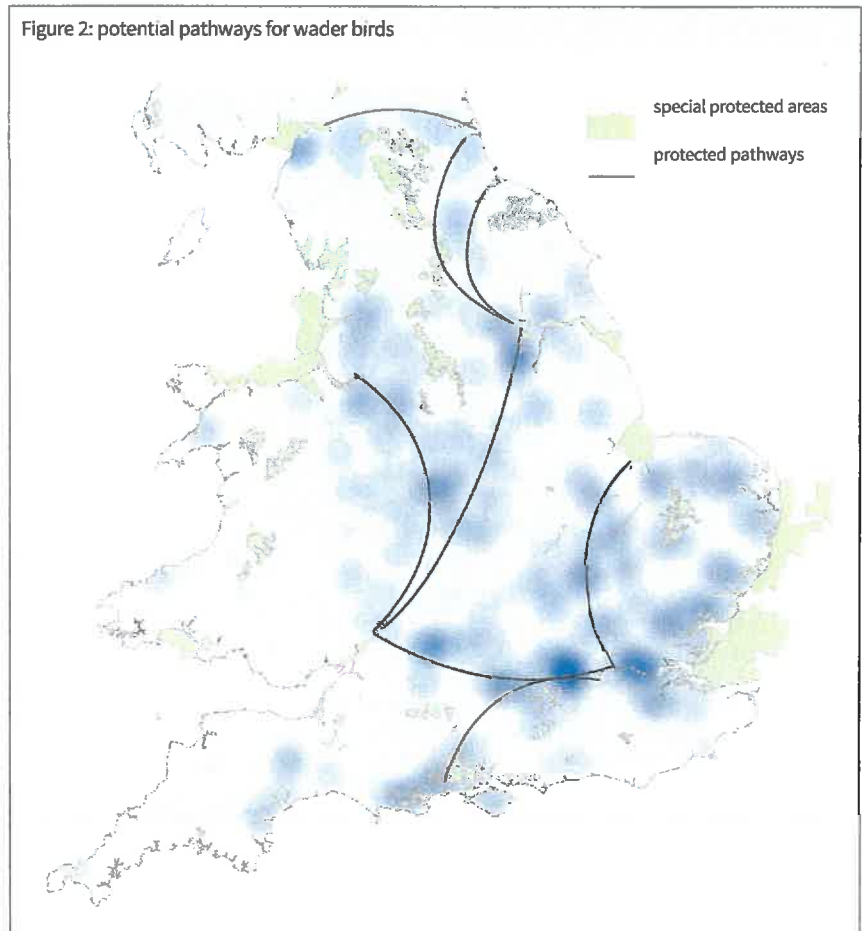
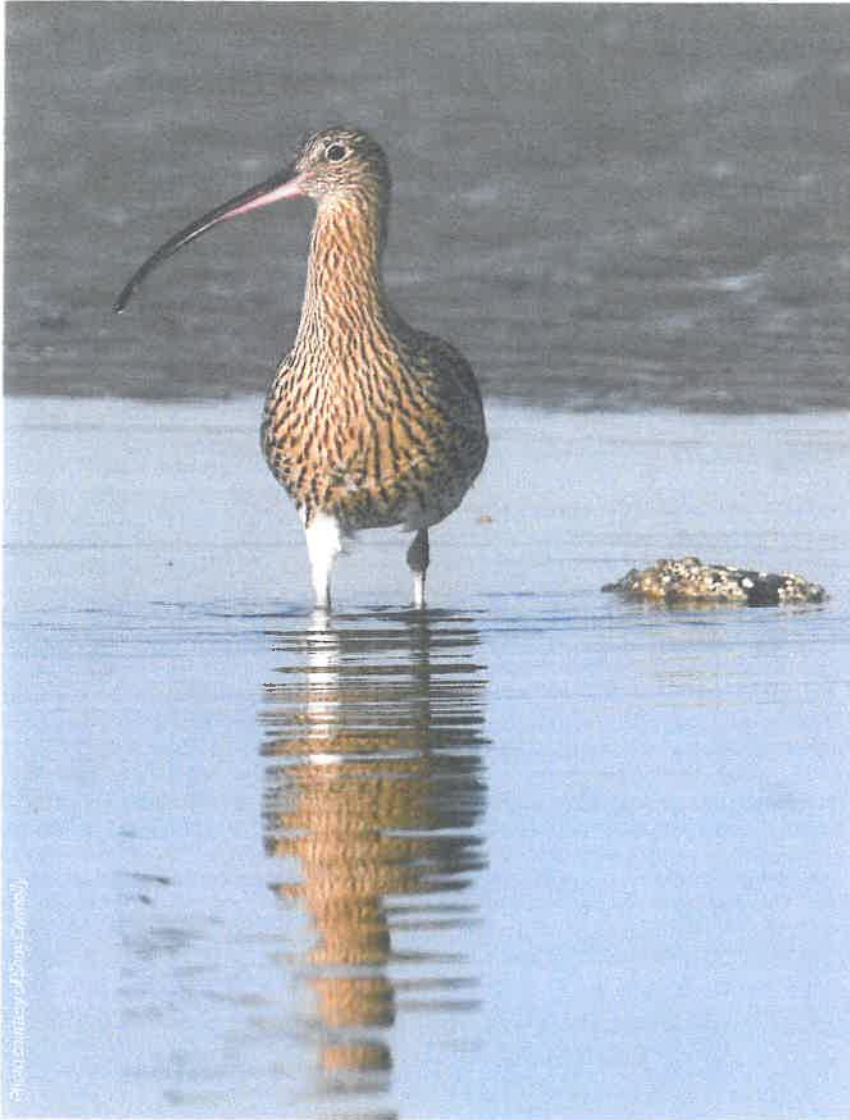


Figure 3: quarries and gravel pits offer a refuge to animal and plant species



restoration sites he still assesses the value of quarry silt lagoons for declining birds.

The extended project now focusses on species and habitats of relevance for the eastern Atlantic flyway with fieldwork carried out in the UK and The Netherlands. Its goal is to explore opportunities for aggregates sites to add to wader habitats in the eastern Atlantic flyway and to carry out experimental and observational studies on silt lagoons to develop processes for their effective restoration and subsequent use as wader habitats.

Aggregates sites within the eastern Atlantic flyway migration route are currently mapped and categorised from existing data sources. Phil Wheeler explains: "In the first half of 2014 we have been working on the task of mapping and assessing the state of all quarries in England and Wales using the 'Britpits' database of mines and quarries. This database lists over 11,000 sand and gravel sites, and PhD student Bryonie Fox has sorted the data, mapped it in a geographic information system and located each site to assess

The Quarry Life Award clearly generates added value for our operations and our industry as well as helping HeidelbergCement to gain new insights and ideas for quarry rehabilitation.

its potential for restoration to a habitat suitable for wading birds." Further, mapping the extent of each quarry site helps to evaluate the potential total resource that these sites might provide and how sites are distributed across the landscape. "We have undertaken a preliminary spatial analysis of sites in North Yorkshire which has identified a corridor of 'stepping stone' sites between important areas for waders, allowing us to differentiate between sites which would be high priority for restoration to support waders and those which would be lower priority. Repeating this

analysis for our national datasets will give us a searchable map to help quarry managers and planners across the country assess whether their sites are in areas of high priority for restoration to support wader populations," adds Wheeler.

Moreover, a multi-site study of wader use and the sedimentary/ecological dynamics of silt deposition sites will be carried out over a two-year period until 2016. The study will examine three UK sites and three in The Netherlands. Sediment samples will be taken from well-used wader feeding positions in the vicinity of the UK quarry sites and characterised by particle size, chemical composition and nutrient availability. Study plots at the Wykeham quarry will have trial manipulations modifying sediment characteristics on locations at the established silt lagoon site. These will be monitored over a full calendar year to assess changes in sediment properties and the establishment of sediment invertebrates.

The derived knowledge will help implement a full-scale experimental/trial restoration at Wykeham. The restoration will be monitored over the final six months of the project. By developing evidence-based restoration techniques applicable at numerous sites, the project will contribute to wider conservation goals benefiting ecosystems that support migratory birds and other organisms.

The QLA – more than just biodiversity management

The Quarry Life Award clearly generates added value for HeidelbergCement's operations and the cement industry as well as helping the company to gain new insights and ideas for quarry rehabilitation. But even more, HeidelbergCement's openness has enabled trust and inspiration among all stakeholders of the QLA.

On the one hand, the company benefits from fruitful dialogue with and among all participants – researchers, students, teachers, local municipalities and NGOs – involved in this competition, inspiring it to move on with its work and consider new restoration techniques as well as the ideas of young scientists. On the other hand, HeidelbergCement has paved the way for a new network of those interested in quarry landscapes and their rehabilitation – a network that gives room to exchange scientific knowledge from one person to another, from project to project, from country to country. The competition has shown that we all can work together and that we can do good together. ■

> More Information

www.quarrylifeaward.com/archive

International
Cementreview

Cement Plant Environmental Handbook

Second Edition

